MORE PAGES, MORE NEWS!!

July 1989

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MODEL AIRPLANE NEWS

THE [illegible] PREMIER R/C MODELING MAGAZINE

$2.95

NEW R/C HELICOPTER SECTION

R/C on a Budget

CONSTRUCTION: SPIRIT OF 74

Build a Thrustometer

F&B: CGM EAGLE 2 TRAINER

HOW TO: Simple Control Mixer

0 71896 48120 07

MODEL AIRPLANE

ON THE COVER: Hoping to get your attention and heighten your interest in the newly added helicopter section being incorporated into *MAN* is Ron Farkas's new GMP Legend helicopter. This heli, along with many other high-quality machines, represents a rapidly growing segment of the R/C sport—one that *MAN* intends to address on a continuing basis. Dick Purdy has prepared a Field & Bench review on the new CGM Eagle II, and he finds that it's the latest in a long line of constantly improving trainers that are ideally suited to the newcomer to R/C. Kodachromes by Rich Uravitch.

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Editorial

by RICH URAVITCH

ONE OF THE THINGS you've probably noticed by now is that this issue of *MAN* is *thicker!!* Why? Well, it's *not* because we've gone to thicker paper, or thicker ink, or anything like that. Some of you, when asked to compare us with other R/C publications, offer that, "theirs is thicker … got more pages." You know, we checked, and you're right! Sure enough, they *are* consistently thicker, so we decided to do something about it. We've added pages to *MAN* and made it thicker. But we and the others still differ in what we choose to have fill those added pages. We've tried to add *information* and, I hope, *useful* material that deals with the fascinating world of R/C helicopters.

Contrary to what you might have heard, or, even—to some degree—experienced, helicopters and fixed wing *can*, and *should*, peacefully coexist. There are no practical reasons why they can't. Think about it. For the most part, helicopters generate significantly less noise than fixed-wing airplanes (and this, as an aside, points up just how much noise is generated by propellers, rather than engines). Helis don't require as much operating room; quite the contrary, for once you become reasonably skilled, you can fly them in much smaller areas, even practicing the hover in your driveway, if it's safe.

So, what's the reason some folks think rotary and fixed-wing can't live together? I suspect lack of widespread information might be a big contributor. You know, "I really don't understand it, so I'll ignore it." It's kind of like the reluctance of some people to accept anything new: new kid in school, new worker on the job, new materials—things like that. It hasn't been here long enough to have "paid its dues," earned its acceptance by the majority. As time passes and knowledge is gained, that same majority laments the time wasted by not accepting it sooner. As I said, I don't think there are any valid reasons; if there are, I'd sure like to hear them.

Meanwhile, sneak a look into our new helicopter section. We hope to use it to turn the negative reasons into positive ones. Any way you look at it, R/C flying is exciting and challenging—regardless of the type of airplane. We can all learn something from one another, and as we have the desire to learn, we should also recognize the obligation to teach.

For those of you who still aren't—or won't be—convinced, *MAN* will continue to strive to bring you the best R/C magazine possible … only just a bit thicker! ■

Rich

MODEL AIRPLANE NEWS
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Airwaves

WHERE TO WRITE TO US

If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" *Model Airplane News*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

Heading for the High Ground

I live in Cairo, but will move to La Paz, Bolivia, in August. I want to know if the height of this city (10,000 feet) will affect the flight of my airplanes. They're the Eagle 63 (with an Enya 40), the Acrohunter (an old design of a biplane with an inverted engine having a 42-inch span and a weight of 2,600 grams) with an O.S. .40 FSR, and the C.G. Sophisticated Lady. I know the height will make a difference, but I don't know how much. Is there anything I should buy on my way there to help cope with this altitude? Please help, as I'm an intermediate flier who doesn't want any conditions to make flight any harder for me.

OLIVER FRINGER
Cairo, Egypt

Oliver, a can of Density Altitude Reducer might help, but I know that there's an active group of R/Cers in La Paz, and I'm reasonably sure that they don't use any extraordinary equipment to pursue the sport. Any readers able to offer first-hand experience?

RAU

Budding Jet Jockey

I've just started in R/C aircraft—primarily gliders. Next year, I hope to purchase a Challenger 720 7-channel radio for those big aircraft I see in my future. After I've been in the hobby for a while, I hope to get involved in ducted-fan projects, and I'm considering either the Violett model of the Agressor II, or the Byron Originals A-4 Skyhawk. I wonder if you could give me your recommendations. This would be a great help, as I really enjoy R/C airplanes.

CHRIS DENNIS
Chesapeake, VA

Chris, hope you enjoyed our April jet issue, which perhaps answered some of your questions. I wouldn't recommend either of the model jets you've mentioned as a first D/F project. There are a lot of models that might work but, based on my observations, it's hard to beat the Byron F-16 or Parkinson Regal Eagle as an entry-level jet. I still recommend getting comfortable with a moderately high-performance sport airplane before jumping into your first jet.

RAU

Tiger Shark Search

I've been involved with all facets of this relaxing hobby for the past 13 years. Most of my experience stems from sport-scale, pattern, Sunday fliers and a finger or two in scale.

Now for my dilemma: I'm currently up to my elbows in a Super Scale F-20 Tiger Shark based on the Knights of the Air kit, and I've drawn a blank on the subject of landing gear. Being stationed in Europe, I can't find any reference material containing photos or drawings of the actual F-20's landing gear or, for that matter, much information on the F-20 itself! Most of my reference covers up to Northrop's F-5, then stops. No F-20!

I would greatly appreciate it if you could pass on my request for any information, photos, 3-views or drawings of the F-20 Tiger Shark and any hints or suggestions on super detailing struts, brake systems, sequencing gear doors and their associated linkages. The sender of any material received won't be forgotten!

Thank you for an extremely informative and entertaining publication. Con-

(Continued on page 10)

Airwaves

(Continued from page 8)

sider me a devoted reader for life!

CRAIG A. GOLEMA
B Co. 2/227 Aviation Regt.
APO, NY 09165

Craig, considering there were only four examples of this controversial machine ever built, there's a remarkable amount of information available on it. The full-scale aviation press presented reams on it, and we did a presentation on it in our May '86 issue. Color prints are available from Bob Banka's Scale Model Research (2334 Ticonderoga, Costa Mesa, CA 92626). Ask for Foto-Paak No. 1365.

RAU

Can. MAN Plans Fan

Congratulations on an excellent magazine. Enclosed is a photograph of my SE 5A, which I just built from your plans (No. 3852). Power is a Saito FA-65, and final detailing must still be completed. If you like bipes, this is one great-looking airplane. Thanks to Mr. Uravitch for the design; I'm sure it will be a hit at the field.

Scratch-building opens up so many choices of aircraft to build, and the feeling of accomplishment is also high when you scratch-build. Everybody should try it! Keep up the great work.

FRANK JAERSCHKY
Guelph, Ontario, Canada

Frank, your SE-5A looks great—better than my original! I'm sure you'll have a lot of fun with it; I sure did. It has been an extremely popular plan, along with its similar-size adversary, the Fokker D-7 (No. 4852). The pair make a great "dog-fighting duo."

RAU

Rockwell Fan

My husband and I really enjoy your publication, especially "Quiet Flight." I love the reprint of your cover on the *MAN* January '89 issue! Unfortunately, you didn't give many details or credit the artist. Was this cover done by Norman Rockwell?

VALERIE M. GOSSERT
Rosamond, CA

No, Valerie, the cover was one of a series prepared in the early days of MAN (nearly 60 years ago!!) by Jean Oldham. His style, like those of many artists of the period, was influenced by Norman Rockwell. They're still favorites with many of our readers. Thanks for writing.

RAU

Fathoming Fine Finishes

I'm a relative newcomer to the R/C aviation world and have some questions concerning finishing materials. Specifically, I'm wondering what paints I can use to provide a fuelproof finish. Can I use enamel, such as Pactra enamels, which come in a variety of colors and seem to be widely available? Can I use enamel colors and spray over them with a clear fuelproof lacquer? What about all those paints available at my local auto-parts dealership? They certainly have a larger selection of paints there than at my local hobby shop. I've asked some of the modelers in my area, and no one seems to agree about what would provide a fuelproof (foolproof?) finish. I'm aware of the Black Baron brand of epoxy paints, but I'm wondering if these locally available paints, in the colors I need, will do the job. Any information you could pro-

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Airwaves

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vide will be greatly appreciated. Keep up the good work!

THOMAS AHL
Enterprise, AL

Tom, most single-part enamels, such as the Pactra brand, aren't fuelproof without some type of clear topcoat, which can be two-part epoxy, polyurethane or, in some instances, clear lacquer.

Same thing with auto body paints. When completely cured, however, the lacquer-based variety seem to hold up to limited exposure to low-nitro (5 percent) fuel.

The most durable but, unfortunately, most potentially dangerous, are the two-part epoxies and polyurethanes, and they're also trickier to work with. Any finishing material, especially when sprayed, should always be used with caution, and only when you're wearing a good-quality filter mask.

I've had good luck using lacquer and enamels followed by two to three thin coats of clear, two-part epoxy, in either gloss or satin finish.

RAU

Assault from the Fan Fly Fathers

Have just finished reading your illustrious editor's write-up of the Southwest Fan Fly of '88. I note with great consternation his references to the lack of dedication to the sport evidenced by the "fathers" of the event and their apparent propensity to party and break airplanes. Let's say this about that!...

First, your illustrious editor was, has been, and is expected to continue to be an honored and welcome guest at all future "parties" hosted by the "Austin Gang." However, if he continues this defamation of such a sterling group, it will be our unpleasant task to lock up all the Dewars, and then where will he be?

Second, with regard to his remarks about the "one-flight stands," let the whole world know that in the six or so years that the SWFF has been held, your editor, claiming "pressure of business," only once brought an airplane to fly! And then, so as not to be embarrassed, he attempted to fly it after everyone had left (obviously, to "party") for the day. He

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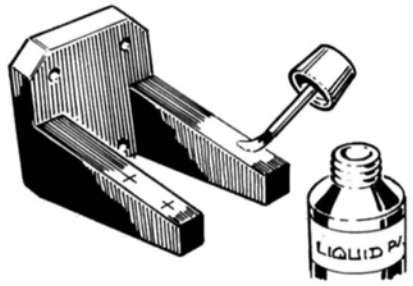
Hints & Kinks

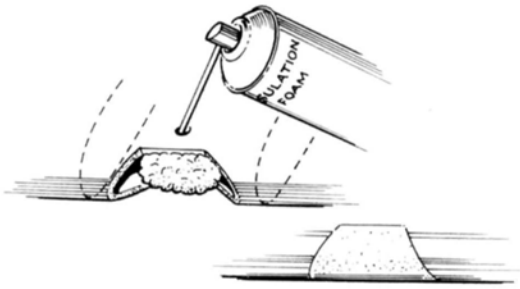
by JIM NEWMAN



EASIER MARKING

It's difficult to make legible markings on black composite engine mounts or carbon fiber, but the answer lies in Liquid Paper correction paint, which dries in seconds. Apply a coat or two where marks will be made (e.g., engine bolts), and when it dries, you'll find this surface readily accepts pencil, pen, or scribe marks. When you've finished drilling, the paint is easily removed with solvents that are usually in your shop.

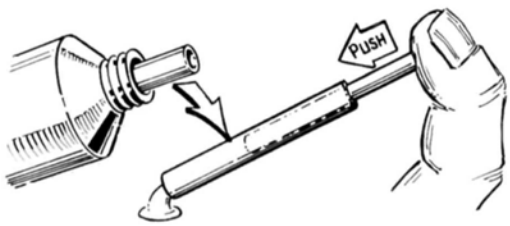
Bob Blantz, Huntington Beach, CA



ARF WING REPAIR

Many ARF kits have hollow wings that aren't easy to repair. If you have a crushed leading edge, clean the area thoroughly, cut away the damaged part, then pierce a small hole to the rear of the damaged area. Through this hole, inject a few shots of insulating foam from one of those handy aerosols, and when the foam has set, you'll find that it can be carved and sanded to match the original leading-edge contour. Patch it with a piece of low-temperature iron-on covering film.

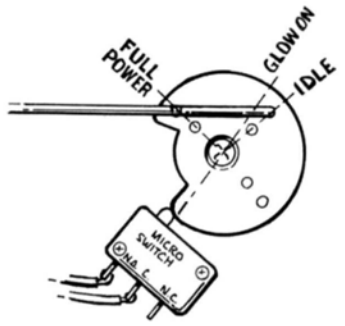
Henry A. Loos Sr., Waterford, NY



MINI SYRINGE

This is a neat, highly controllable method of dispensing silicone sealant. Push a piece of outer Nyrod into the tube of sealant, then withdraw it. This loads the Nyrod with sealant. Now insert a plunger cut from a piece of inner Nyrod and, keeping the plunger capped with your finger, gently push. This will accurately inject small amounts of sealant.

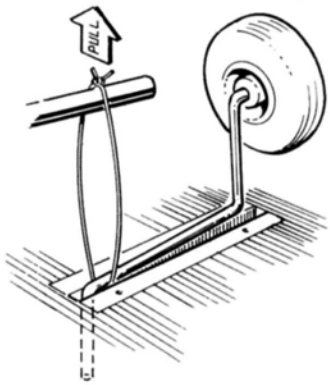
David Sheehy, Mitcham, Victoria, Australia



ON-BOARD IGNITION SWITCHING

Use this handy cam and microswitch on the throttle servo. The cam is made by cutting away part of the servo wheel, and the switch is mounted so that it's turned on by the cam when the power is reduced to approximately quarter throttle.

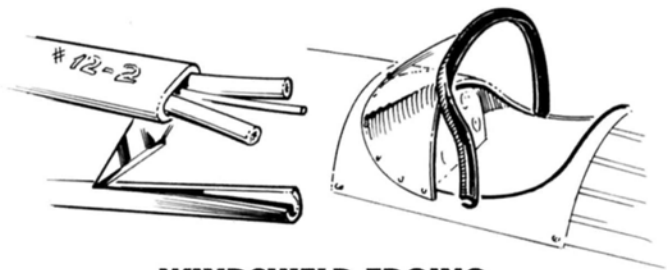
Robert Petre, Christchurch, New Zealand



REMOVING STUCK GEAR LEGS

After removing the clips, you might find a leg stuck in the mounting block, and it's difficult to pull straight up on the vertical part. Make a loop of strong fishing line, then slide it along under the horizontal torsion-bar part of the gear, as shown, until it reaches the vertical embedded part of the gear. You can now pull straight up to extract the leg.

Fred Mulholland, Tampa, FL



WINDSHIELD EDGING

One foot of No. 12-2 electrical wire costs very little. Strip away the heavy outer covering to expose the conductors, then pull the copper wires out of the insulating covering. Now slit this covering, cut it to length and glue around the edge of the windshield with CA.

Tim Crowley, Anchorage, AK

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News,** 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.

Small Steps

by RANDY RANDOLPH

IT HAS BEEN over 30 years since the last .074 engine was available to the modeling public as an off-the-shelf item. The difference between an .049 and a .074 isn't that great in actual displacement, and in the old days, there was little difference in performance, but the Cox* Queen Bee .074 is a horse of another color. In fact, it is just that—a horse!

The Queen Bee slightly resembles the conventional Cox designs in the cylinder and spinner, but there the similarity ends. The carb is mounted on the back of the crankcase and there's a genuine muffler wrapped around the exhaust ports. Another notable change: The head is drilled for a regular glow plug! While the cylinder could have been salvaged from the .099's, this is a new engine.

The good things! The throttle actually works. It isn't quite as good as the G-Mark, but it does offer a good mid-range and a nice idle. The best part is the power: With the muffler in place, the engine will spin a 7-3.5 Cox gray prop at more than 15,000rpm on 10- to 15- percent fuel, and that will snatch a 2-pound airplane all over the sky. Fuel with higher nitro content improves the performance even more! It's a good engine.

The not -so-good things! As I write, there's no commercially available mount, but Cox is working on one and should have it ready by the time this column appears in print. The needle valve is located right under the muffler, and although it's safely away from the prop, it makes tight cowlings difficult. The throttle arm and fuel intake are reversed from those on most engines in this range, so some additional modification would be necessary to fit it into existing aircraft. This will be a popular engine for small- to medium-small R/C airplanes...the kind we love!

Small is small, all right! Jim Simpson's peanut-size R/C.

One of my pictures shows the hand of a very famous man, and it's holding a genuine R/C airplane powered with a Cox .01. The man is Jim Simpson, author of numerous articles in model publications and one-time sales manager for EK Radios. The airplane is an N-3 Pup, which is just barely bigger than a peanut-scale rubber model. Jim came to the Small Steps Fly-In with this and a big N-3 powered with a G-Mark .061! That man has class!

The Cox Queen Bee .074 in all its glory! Not at all like the last .074 back in the '50s.

Jim's peanut R/C is commanded by an Ace* Pulse Commander. I haven't seen this equipment listed in Ace's catalog for some time; it's probably a victim of the current frequency program. The small, light pulse systems were single-channel only and provided for proportional left and right rudder. The fact that they still work is demonstrated by Jim's good-flying, good-looking airplane.

Since the .010 is out of production and the pulse systems are no longer around, about the only thing in the picture that's still available is Jim's hand. If you get the chance, shake it, and you can tell everyone that you shook the hand of Jim Simpson!

While on the subject of really small things, we have a photograph showing a comparison of a .010 and an O.S. .25. If you were to unscrew the cylinder from the .010, it would almost slip into the carb air

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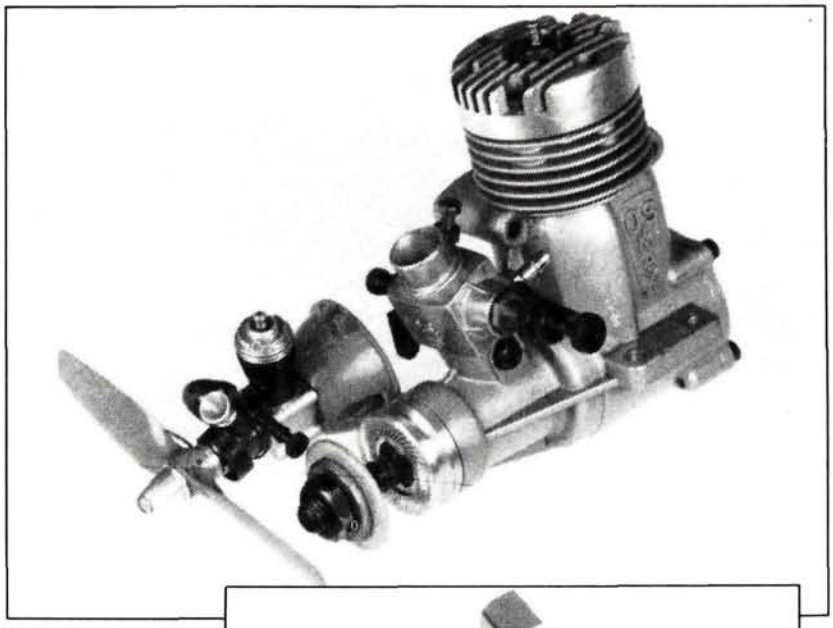
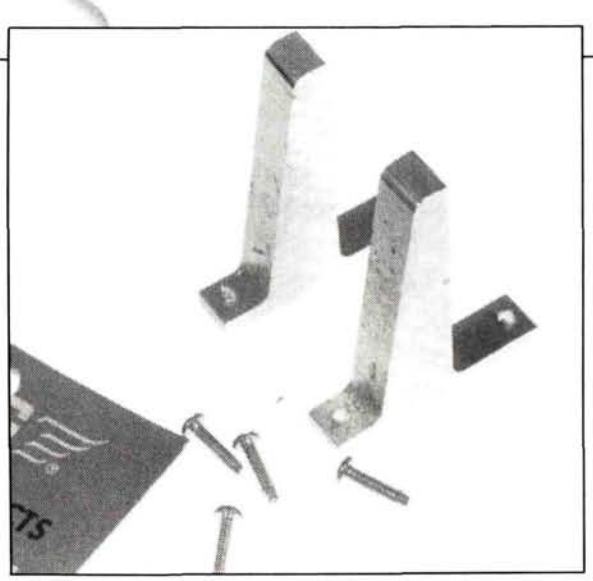
SMALL STEPS *(Continued from page 16)*





Above: The great big engine is a .25; the other is the engine that powers the peanut-size R/C's—the Tee Dee .01.

Right: The two-piece Sig aluminum mount for small engines is about the only commercially available mount for the Cox Queen Bee.

intake of the .25! As for rpm, the .010 is the hands-down winner. On the 3-inch prop shown, that little guy will turn a cool 26 grand!

This column includes airplanes powered with the other engine pictured, too, but it seems that a preponderance of letters favors the smaller side of the .01 to .25 scale. The .20 and .25 engines are still the best bargains in the model airplane business. There are a lot more kits available for these engines than for the smaller ones, so you'd think that they'd be the most popular. While on the subject, let's raise the top limit of our "smallness" to include the .26 4-strokers. There are a lot of those beauties out there, and they should find a home here with us rather than in that "other world." Now then, all you small-strokers: Let's hear from you.

The Dallas R/C Club has already scheduled the Second Annual Small Steps Fly-In for next fall. As usual, there will be no trophies, no prizes and no contest: just rag chewing and fun! Well, maybe there will be one or two prizes! Good ol' *MAN* will be the sponsor, so there will be goodies for all. The certificates issued to the faithful who attended last year's fly-in are now collectors' items, and if you want to collect *your* item, be there! The dates are October 14 and 15, and the site is the Dallas R/C Club field at Seagoville, TX. Should be fun!

**Here are the addresses of the companies mentioned in this article:*
Cox Hobbies, Inc., *1525 East Warner Ave., Santa Ana, CA 92705.*
Ace R/C Inc., *116 W. 19th St., Box 511C, Higginsville, MO 64037.*

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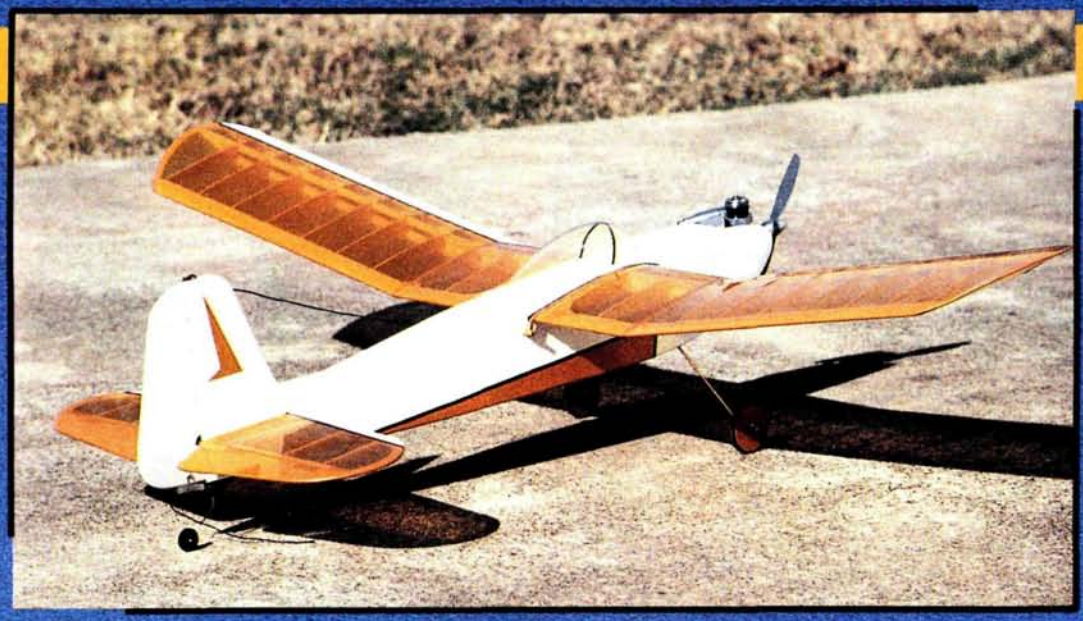


THE NEW COX* .074 is a good engine. At this stage of its history, it's not a great engine, like the TD .049, but the potential is there. It fills the gap between the .049s and the .099s for the first time since the OK Cub and Fox .07 engines of the '50s, but, unlike the Cub, this engine is a horse! The .074 should find a place in smaller R/C airplanes for some time to come.

The Spirit of 74 was designed to take advantage of the additional power available from the .074. It's a little larger than the typical .049 designs and, even though it's a 3-channel machine, the additional power and the tip dihedral result in a very smooth-flying airplane. The steerable tail wheel was added to take advantage of the throttle so the Spirit could be taxied out just like the 1/4-scale birds. There's plenty of room in the fuselage for full-size radio equipment and enough wing to handle the additional load. The shoulder/wing configuration was selected to facilitate hand-launches from unimproved fields.

The G-Mark .061 would be a good substitute for the .074. To utilize the G-mark, the fire wall should be moved forward so the engine drive washer is in the same plane as that shown on the plans for the .074. The only other change would be to exchange sides with the throttle and fuel lines. The throttle response of the G-Mark is somewhat better than that of the .074, and it's a good trade-off for the loss of a little power.

SPIRIT OF '74

A small-field, fun airplane that provides a home for the new Queen Bee.

by RANDY RANDOLPH

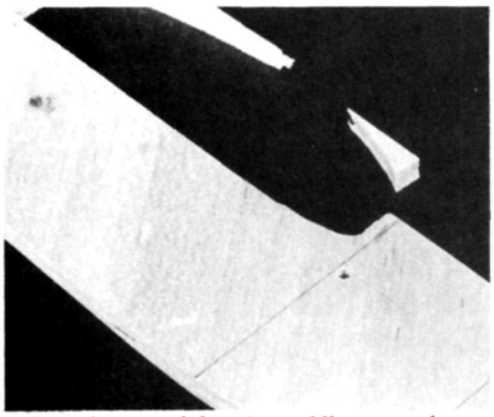
PHOTOS BY RANDY RANDOLPH

SPECIFICATIONS

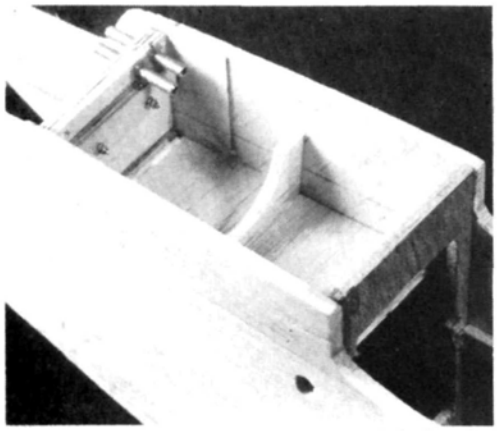
Wingspan: *44 inches*
Length: *30 inches (31 3/8 overall)*
Weight: *24 ounces*
Wing Area: *297 square inches*
Wing Loading: *11.6 ounces per square foot*
Power Required: *.049 to .075*
Number of Channels Required: *minimum of 2; 3 if throttle control is used*
Materials: *Balsa, poplar and birch ply, music wire*

CONSTRUCTION: The wings are a good place to start, since they take a little more time. But once the pieces are all laid out, they go together easily.

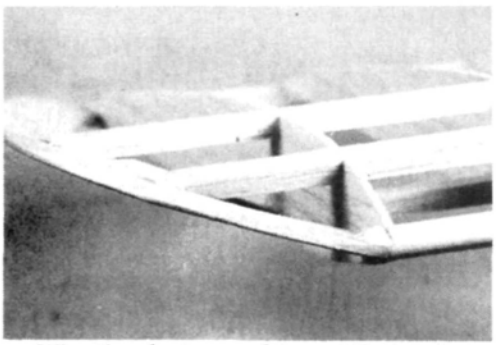
You'll need 23 ribs cut from 1/16-inch sheet balsa. They can be cut from a printed sheet made by tracing around a card-stock template with a pen, or they can all be cut at the same time by stacking balsa blanks together, tracing the rib pattern on top and sawing them with a band saw or a jigsaw. If you use the printed-sheet method, after



Save the part of the wing saddle cut out from above the wing; later, it will be used to complete the wing-fuselage fairing.



Half-circle formers hold the round fuel tank. Tanks of other shapes are wedged into place with foam blocks. Brass-tube fuel and overflow lines would have to be relocated for engines other than the .074.



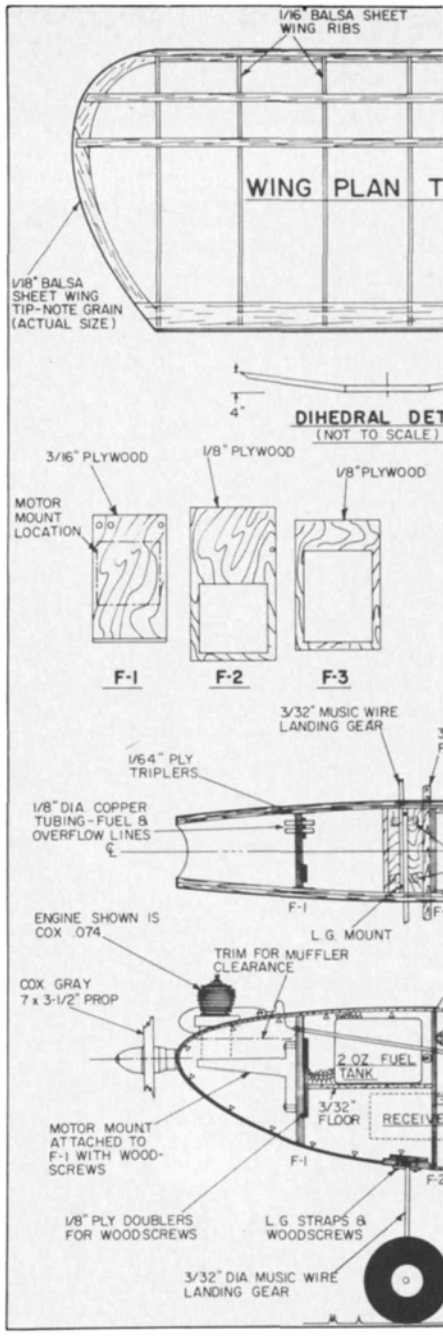
Wing tips slant upward to meet the top spars and are then sanded to match the top camber of the wing. Scraps of soft wood fair the leading edge into the tip.

they have been cut from the sheet, they should be stacked and pinned together, then gang-sanded to smooth out any high or low places that might have crept in during the slicing.

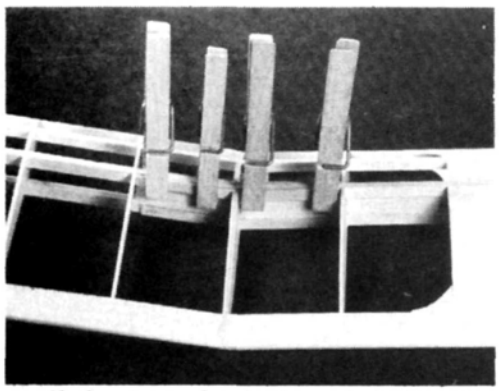
For the center-section ribs, select three ribs and trim 1/16 inch from the top and bottom of each. Cut the webs from 1/16-inch sheet. Webs add a lot to the strength of the spars and add little weight. The spars are stripped from straight-grained 3/16-inch sheet. This can be done by using a straightedge razor knife, or one of the balsa strippers on the market. Slice the tip pieces from soft 1/8-inch sheet, and notice the direction of the grain in each piece.

The wing is built in three sections. Cover the plan with wax paper, and start building the center section by pinning the bottom main spar into place on the plan. Slip some ribs onto the spar, and use them to position the trailing-edge sheet so that it will match any slight difference there might be in the length of your ribs and the plan. Pin the trailing edge into place, and, starting with the three trimmed center ribs, glue ribs and spar webs into position. When installing the end ribs, use the template to trim the web to the proper angle so the ribs will be slanted to make the dihedral.

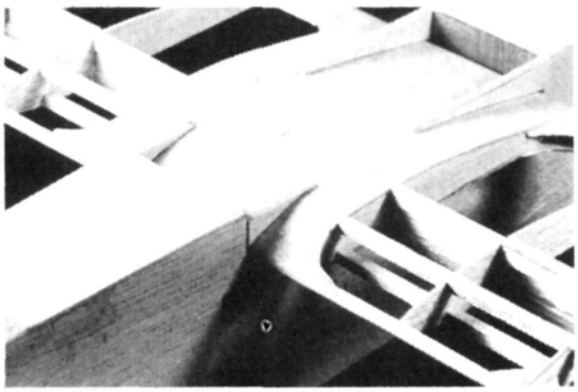
When all ribs and webs are installed, add the top main spar. Make sure that it's glued to all the webs as well as to the ribs. The leading edge and front top spar can be installed at this time, but don't add the top trailing-edge sheet yet. It will be installed after the wings have been joined at the dihedral joints. Build



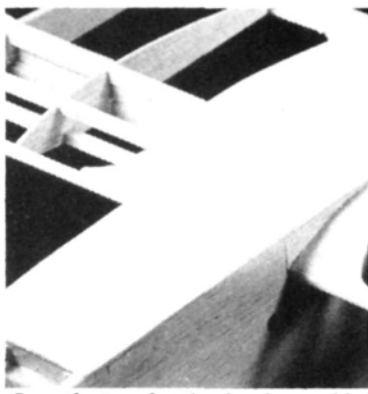
the other two wing sections in the same way, with the angled ribs at opposite ends. The tips are glued to the two tip ribs. Notice that they slant upward to become flush with the top of the top spar



Clothespins are handy clamps for holding the ply dihedral braces against the spars while the glue sets.



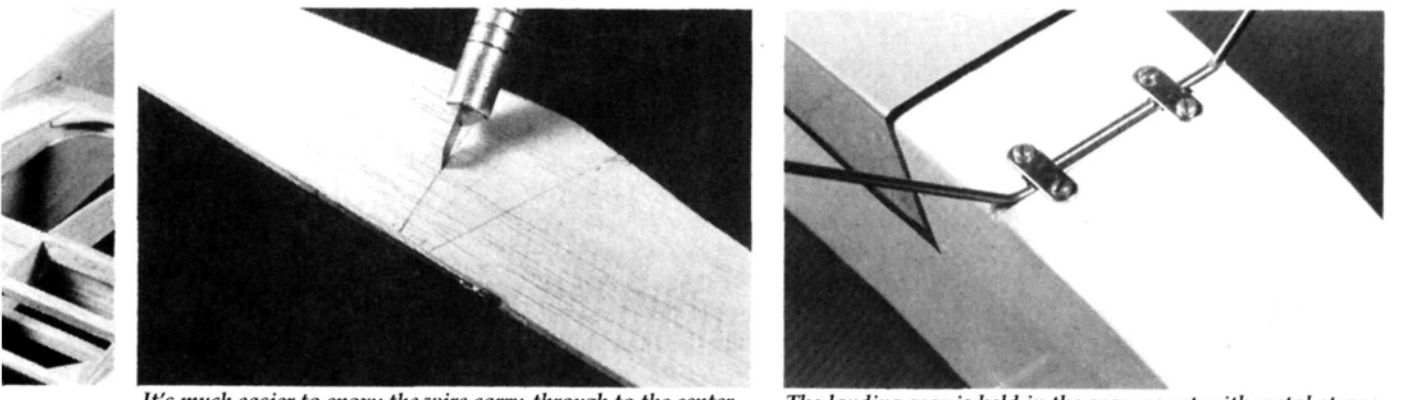
Hold the wing in position on the fuselage, and glue the pieces saved from the saddle cutout on the wing to correspond with the fuselage sides.



Once the top sheeting has been added to the wing fairing, it's sanded to blend with the fuselage.

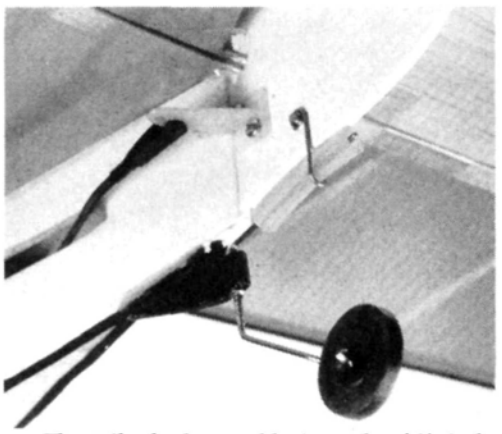
stubs. Use scrap spar material to build between the bottom main spars and the tips.

When completed, trim all spars and trailing edges flush with the slanted ribs, and slice the dihedral braces from 1/16-inch plywood. Using a sharp razor, slice 1/16 inch from the dihedral ribs on each side of the main spars to fit the plywood dihedral braces. Place the center section flat on the bench, elevate the tip sections to the dihedral angle, and install the braces. Check for fit, then glue all the joints. Add the top trailing edges, then the center-section sheeting. Notice that

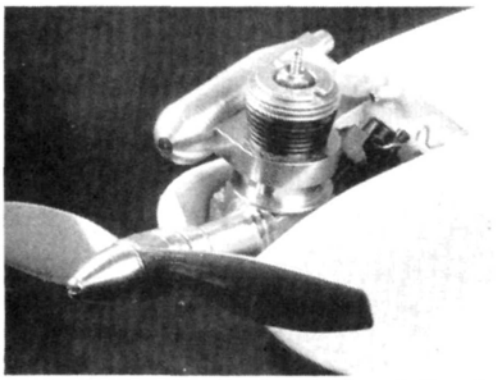


It's much easier to epoxy the wire carry-through to the center leading edge of the elevator before making the rudder cutout.

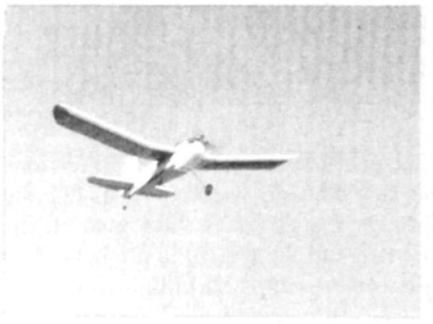
The landing gear is held in the gear mount with metal straps and wood screws, which are available in all hobby shops.



The tail-wheel assembly is made of 1/8-inch plywood and 1/16-inch wire. The mount is epoxied into a notch cut in the bottom of the fuselage. Fuel line over tiller acts as a shock absorber.



Engine installation. Loop in throttle line allows easy adjustment of throttle linkage and relieves strain on the servo.



#7891 SPIRIT OF 74 $9.50

The newest design from the prolific Randy Randolph, the Spirit of 74 was specifically developed to utilize the Cox Queen Bee 074 R/C engine, although flight testing has shown that it's equally capable with the T.D. 049/051 engine when throttle isn't a requirement. The stability of the design is such that, in spite of the fact that it's of shoulder-wing configuration, ailerons are not required. Of simple construction, the 44-inch wingspan Spirit can be built quickly, and flown easily by the novice R/Cer. Single-sheet plan.

the sheet goes *between* the spars rather than over them. Sand the completed wing.

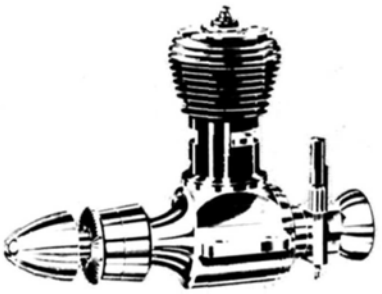
Like the wing, the stab, elevator and rudder are built right over the plan. The two 1/32-inch plywood spar doublers shouldn't be eliminated, because they add strength to the stab in this area. When complete, join the mating surfaces and sand the outlines to match. Inset and epoxy the music-wire carry-through into place at the leading edge of the elevator.

FUSELAGE: The fuselage sides are cut from *medium* 3/32-inch balsa sheet. Don't cut the wing saddle into the sides until after the doublers have been glued into place. The doublers are also 3/32-inch balsa—this time hard stock, laid with the grain at a 45-degree angle to the grain of the sides. After the doublers and the 1/32-inch plywood triplers have been cemented into place, pin the two sides together, and sand them to the same outline with a sanding block and 100-grit sandpaper. While they're still pinned together, cut out the wing saddle, saving the removed part that goes over the wing, and drill the 3/16-inch holes for the wing-holding dowels.

Separate the sides and add the 3/32-inch square uprights, as well as the servo-mounting rails. Cut out and drill the fire wall and the two cabin formers. Epoxy the 1/8-inch ply doublers on the back side of the fire wall that receives the engine-mount screws, and start assembling the fuselage by gluing the two cabin formers in place on one of the sides. Make sure they are perpendicular to the side by using a right triangle. When dry, glue the other fuselage side to the formers, and make sure it's in perfect alignment with the first. Bring the tail together and glue, then dry-mount the fire wall. It's a good idea to use epoxy to hold the fire wall in place.

Build up and glue the landing-gear mount into place just in front of the first cabin former. Sheet the bottom of the fuselage with 1/16-inch balsa with the grain running across the fuselage. At the lower, aft fuselage, 1/16-inch plywood replaces the balsa to provide a mount for the tail wheel. Epoxy the 1/8-inch brass-tube fuel and overflow lines, as well as the Nyrod for the throttle line, through the fire wall, and install the floor in the tank compartment. Wedge the tank into place with foam, and connect it to the

(Continued on page 37)



COX ENGINES: FROM SPACE BUG TO QUEEN BEE

NEWCOMERS TO R/C are probably unaware that Cox Hobbies has been producing model engines for decades. While the Queen Bee may be its latest offering, it's only one in a continuing chain of engines appealing to the modeler who prefers small airplanes.

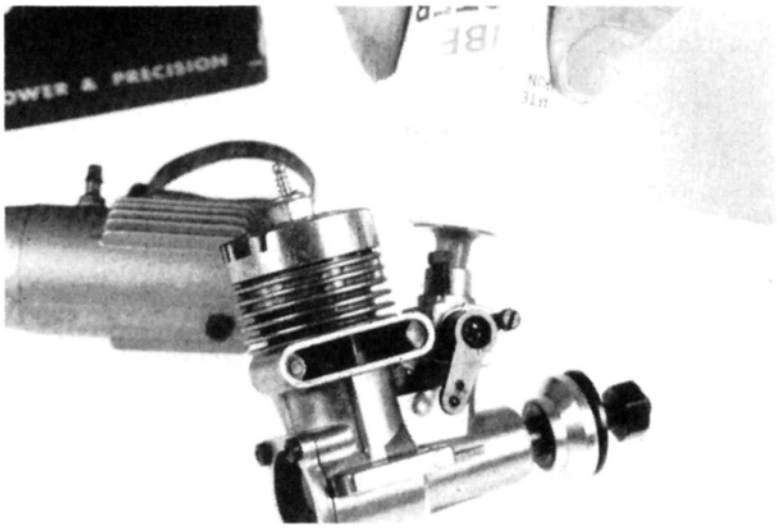
The largest engine that Cox ever mass-produced was the Conquest .15, which was available in "carbureted" (R/C) and "non-carbureted" (C/L and F/F) versions. By contrast, the opposite end of the displacement spectrum was occupied by the diminutive TeeDee .010. Supplied with a 3-inch propeller, this lilliputian wonder was introduced at trade shows by Cox people who displayed them mounted to polished silver clips and worn as tie bars!

When you consider the huge quantity of R/C, control-line, and free-flight ready-to-fly vehicles Cox has produced over the years, in addition to the specialized, high-performance engines like the F/F Thermal Hopper and the racing T.D. 049/051, it's easy to see that literally tens of thousands of these precision-machined gems have gone out through the Cox factory doors, and this is a trend that's likely to continue for some time to come.

A bit of modeling trivia: Ever wonder what the initials "T.D." or the word TeeDee" actually stand for? THIMBLE DROME, that's what! Even *we'd* like to hear about the origin of *that* one!! ■

Basics of Radio

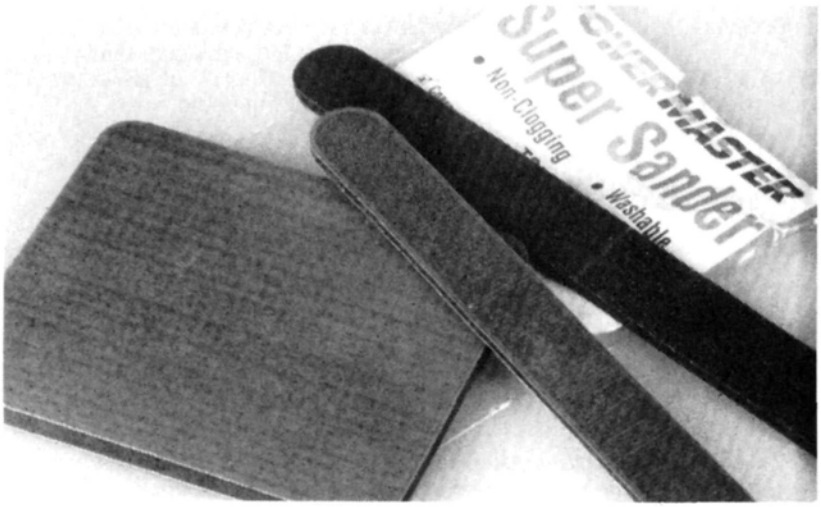
by RANDY RANDOLPH



TECHNOLOGY HAS BEEN called a running horse and with good reason. Those who are new to the technology race can only grab the saddle horn and ride into the future, hoping to learn along the way. Even though this approach is infinitely better than clinging to a system that has become obsolete, it must be remembered that the past is always part of the present and that it will mold the future. Modeling is no exception: Most of the things we use and the practices we follow are adaptations of the tools and techniques that were introduced to our hobby more than 75 years ago, or even longer!

Sandpaper, which has been around for a long, long time, is an example of something old that's been improved. Although garnet and aluminum-oxide grits have almost completely replaced it, the newer products are based firmly in the past. The newest space-age abrasives are mated to a soft but firm base, e.g., the Super Sander from Powermaster*. On balsa, this is the fastest cutting-and-sanding combination you can use. Another great advantage is that these things are washable! Those shown in the photo have been used several times, washed after each use with water and a brush and allowed to dry. These three pieces have seven different grits, from very fine to coarse. The Super Sander may be a space-age product, but it's used the same way as a thousand-year-old tool!

Lubricants have been with us ever since the first caveman discovered bear grease, but not any one lubricant fits all demands. Our engines fall prey to several by-products of combustion. The oil that provides the best lubrication while the engine is running doesn't necessarily provide the best protection while the airplane is hanging on the wall, waiting for the next flying



Top photo: After-run oils are necessities. This one is from the fuel people, Powermaster Products.

Left: Sanding and sandpaper are old tools, but this is a space-age improvement.

Above: All but one of these adhesives is a relatively modern product. Which is the old-timer?

Control

session. The additives in modern fuel provide more power than ever before, but they leave things behind that must be neutralized. The use of an after-run oil is necessary for good engine life.

Before long-term storage, engines should be well-saturated with an oil designed especially to protect bearings and mating surfaces. That means injecting healthy doses into the carb intake, as well as into the exhaust ports. Four-stroke engines are especially vulnerable to combustion by-products, because the crankcase and main bearing areas aren't exposed to fresh fuel with each intake stroke

while they're running. The crankcase breather allows access to the crankcase area and is a convenient way to inject protecting oil into this vital area, which you should do after every flying session and especially before long-time storage.

Are these new products? No, just improvements on the grease for the squeaking wheel!

Our friend, the caveman, was also the first one to use an adhesive, but in his case it was animal blood. For a long time, glues made from animal proteins (hides) were the standard adhesive, until technology demanded better ones. Early modelers made their own glues by dissolving photo film in acetone. As the hobby grew, the cellulose glues were adapted to our use and the first model-airplane cements were invented. Ambroid is a name that was well-known to modelers well over half a century ago, and it's still available and going strong! By offering slower curing times and gap-filling properties, the newer CAs are starting to emulate model-airplane cements. Just a few of the varieties of glue that are currently available to modelers are pictured, and they all do a better job than the animal blood that started it all.

The point of all this is to show that, regardless of the new problems and products that we encounter in everyday building and flying, someone has been there before us. The answers to most of our modeling questions can be found at the local model club, flying field, hobby shop, or library. There are a number of publications available from this magazine that outline most facets of building and flying all kinds of R/C aircraft, as well as information about R/C boats and cars.

It's been said that someone who *won't* read has absolutely no advantage over someone who *can't*. The information is out there for the taking, but you do have to look, and you do have to read! That's basic!

**Here's the address of the company mentioned in this article:*
Powermaster Products Inc., *10103 Freeman Avenue, Santa Fe Springs, CA 90670.* ■

The proud moment before the first flight of my first R/C airplane. (Red-and-white scheme chosen for visibility.)

HOW I SURVIVED... MY FIRST YEAR IN R/C

A two-year "veteran" reminisces about the tough part

by DAVID EGGEBRAATEN

AFTER COMPLETING my first year in radio-control, I looked back in complete amazement. How did my trainer airplane survive more than 150 flights with me—a complete novice—at the controls? Someone who had never even seen R/C in action? Someone who tried to learn to fly alone? I'm convinced there was one very important reason: The trainer that was chosen for me was the Tooter.

Last spring, it was my good fortune to have lunch with the officers of the Montana Bitterroot R/C Club. Among them was club president Jim Bigley, who designed the Tooter. (See *MAN's* September '85 construction article, plan No. 9851). The Tooter was suggested as my first airplane, as it had been to other new club members before me.

Because of my eagerness to fly, I was disappointed to hear that it wasn't available in kit form or as an ARF (Almost Ready to Fly). I was delighted to find out that another club member, Paul Wilson, had outgrown his. A phone call later and an evening with Paul ended in frustration. He had just sold his Tooter!

Left: A moment of another type ... this one of truth! (About to launch.)

Scratch-Building

I wanted to fly, to soar with the eagles. Spring was in the air. Who had time to learn to scratch-build with a perfectionist? Twelve dollars worth of balsa later, Paul was

Moving up to a low-wing aileron airplane (in this case, the Great Planes Sportster) was a big step.

Progress! I've expanded the "airport" by adding floats to the Tooter and giving float-flying a try.

PHOTOS BY DAVID EGGEBRAATEN

patiently showing me how to cut wing ribs with an X-Acto knife. Within four weeks, we had the plane covered with highly visible red and white Coverite* Micafilm, the O.S.* .10-size engine broken in and the Futaba* radio installed. My inexpensive Tooter was ready for its maiden voyage.

Scratch-building my first airplane gave me more admiration for the hobby. I now feel that it's more than just flying, it's the deep respect you gain for your instructor and the knowledge of what makes airplanes air-worthy. This first-hand knowledge of the insides of your craft is invaluable if you have a mishap that requires repair.

Because of my new-found friend's advice, I pay more attention to detail, and I've become a better builder and flier. Try scratch-building, you'll be glad you did.

First Flight?

The ideal training method is to have an experienced R/C pilot at your side. They can take off and land your craft while you learn the controls by flying high, large circles. Your progress can be monitored until both of you are comfortable with the timing of your first solo.

Above: An almost inevitable part of the learning process: the crashes. Few beginners escape this phase!

Unfortunately, schedules have a tendency to become complex. When Paul went flying, I was out of town. When I needed my first flying lesson, he was busy. Having built my Tooter with a two-piece wing, it fit too easily in the trunk of our car for family trips to the lake cabin. As fate would have it, impatience set in.

The first weekend in June, I found myself in an open meadow beside the lake, running the engine full-throttle and testing the elevator and rudder controls. An audience of three was there for my first flight: my mother, my father and my son. No flight instructor, no other R/C pilots and no one else who knew what, when or how to fly! I had a knot in my stomach as Dad hand-launched the Tooter.

The Tooter was up and climbing and looking great. It turned to the left and came back around. But something was wrong and it started coming down! I'd heard if you let go of the transmitter sticks, the plane would fly straight and level. While I was standing there trying to make a decision, the plane was flying towards us in a full-throttle power dive. As Mom jumped out of the way, the Tooter hit the ground with a sickening thud.

Everything was quiet as the dust settled. After we helped Mom up off her hands and knees, we searched for airplane parts. The engine was buried in the dirt and the motor mount and propeller pieces were spread all over the ground. Thankfully, the Tooter was still intact.

An hour later, we were in the same meadow with a cleaned-out engine, a new propeller and an engine mount that was glued and wired together (we didn't have a spare.) With the same knot in my stomach, flight No. 2 was on its way. Once again, it was up and climbing and looking great. It turned to the left and came back around again. But something was wrong and it started coming down, *again!* As I released the transmitter sticks, the full-throttle Tooter hit the ground with a sickening thud, *again!*

A crash can usually be diagnosed by an experienced and knowledgeable pilot. I was neither, but I was able to analyze two identical flights that ended in two identical crashes. The Tooter was still OK, except for a completely shattered

The words on the wings explain the transition from initial blind optimism to exuberant confidence.

engine mount. Working the radio controls, I noticed something that I had completely forgotten about: trim tabs. The plane would have flown hands-free, straight and level, if it was properly trimmed! Remember: Always trim your airplane on its first flight of the day.

The First Real Flight

Your first R/C airplane must fly slowly. This is a point worth repeating: Your first airplane must fly slowly! The Tooter, like a full-size aircraft, has complete freedom of movement in the air. Up, down, left, right and forward are all controlled by you, the pilot. The slower the flight, the more time you have to react to what the model is doing.

The next weekend, I shuttled my family and the Tooter back to the open meadow by the lake. With this slow-flying craft, the next two flights gave me time to play with the trim tabs, throttle settings and glide rates. The 2-ounce fuel tank gave me 10 minutes of flying. After the engine ran out of fuel, it then became a glider. Having not yet mastered landings, I just plopped it down in the weeds, breaking only props. (It was later suggested that I buy props by the pound.)

Flight five produced my first aerobatic loop. I didn't know exactly what happened (I sus-

(Continued on page 85)

FIELD & BENCH REVIEW

CARL GOLDBERG MODELS

EAGLE II

by DICK PURDY

EAGLE II IS Carl Goldberg Model's* new and modified version of its Eagle 63, which is a long-time favorite in the model airplane fraternity. This new plane is a nearly perfect trainer, and I admire its simplicity very much. That must be its key to success: The subtleties of a superior design have evolved into a simple, but elegant, form.

The following modifications have been made to the Eagle II:

- The balance point has been shifted forward, and the main landing gear has also been slightly relocated. This makes the plane very light on its nose wheel, and it enhances ground handling.
- A slight addition to the fin area should improve lateral stability, while giving the rudder/fin shape a more rakish look.
- The thrust angle of the engine has been increased from -4 degrees down to -8 degrees down. This improves flight characteristics for the novice pilot by bringing the nose up in dives.

In building my Eagle II, I also discovered that the instruction booklet has been expanded. This new manual is a 72-page home course in

Newest version of this popular trainer incorporates improved cosmetics and buildability

SPECIFICATIONS

Manufacturer: *Carl Goldberg Models*
Type: *63-inch-span sport/trainer*
Length: *49 inches*
Weight: *5 1/4 pounds*
Wing Area: *715 square inches*
Wing Loading: *17 ounces per square foot*
Power Required: *.29-.45 2-stroke, .40-.61 4-stroke engine*
Radio Required: *3 or 4 channels*
Sug. Retail Price: *$74.99*
Features: *All-wood construction kit of excellent quality in both material and presentation. Construction manual among the best around. Excellent hardware package and construction plans are included—a big help for the beginner.*
Comments: *Excellent trainer, with an instruction manual of unsurpassed value to beginner builder. Easy to build and very easy to fly.*

PHOTOS BY RICH URAVITCH

Owing to fuel-feed difficulties, the first two flights resulted in dead-stick landings. After curing the problem, Dick Purdy is really enjoying the Eagle II.

model airplane construction and flight instruction. I've never seen a better manual! Many excellent photos and sketches appear throughout the sequential steps of assembly. An unusual feature in this kit is the large number of options it offers, such as:

- electric vs. glow engine
- 3- or 4-channel radio (with or without ailerons)
- wing mount with bolts or rubber bands
- three different dihedral angles for the wing
- tail wheels vs. tricycle landing gear
- floats for aquatic mode

Each of these options is amply described and detailed, with a required parts list for each item. I hope you appreciate this kind of comprehensive treatment and attention to detail as much as I do!

CONSTRUCTION: The tail feathers are built up from balsa sticks for the fin and stabilizer, with tapered sheet balsa for rudder and elevator. These are simple and fast to build, especially when using CA, such as Goldberg's Super Jet.

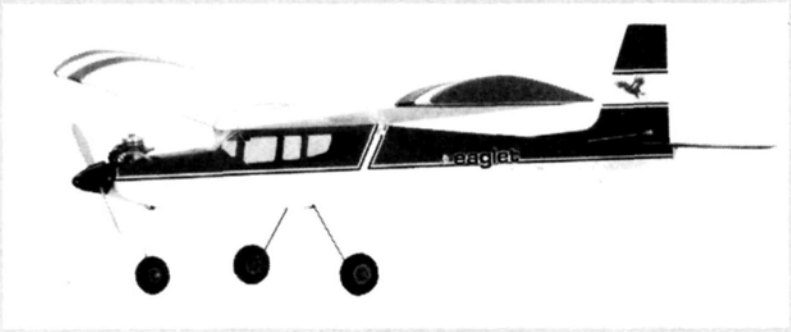
The wing also goes together quickly, with die-cut balsa ribs, a birch-dowel leading edge, pre-formed and notched trailing edge, and ailerons of pre-formed balsa. Very little skill is required here for good results. Wing tips are applied later, after covering, since they're of formed plastic that simply glues on. The wing has one main box spar with pre-cut webbing pieces that go the entire length of the wing. With three options available for dihedral angle, you can select either the no-aileron 3-channel-radio version, which is a very docile aileron trainer version, or you can choose a more aerobatic version with less dihedral.

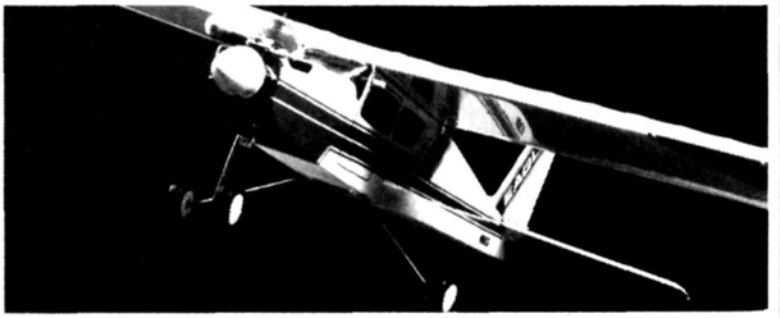
This kit supplies "tools" made of plywood to assist you during construction. These little niceties include clamps to hold laminated parts as they're being glued-up; beveling tools with which to sand the hinged edges of ailerons, rudder and elevators to proper shape; and dihedral gauges for each of the three wing options, with set-back gauges for each of the three angles at the wing center line.

The fuselage is built of die-cut plywood: sides, top and bottom panels. These are keyed together by mating notches to ensure proper alignment. The fuselage isn't particularly heavy, but it's certainly strong enough for active training duty with beginner pilots. Excellent details are provided for mounting several engine options, along with an option for a motor mount to receive an electric motor. The glow engine is mounted on a laminated

(Continued on page 36)

Before-and-after shots of the Eagle 2 prior to the application of covering. Scheme is simple, yet attractive, and it offers good visual contrast for the new flier.





THESE BIRDS ARE SURELY AMONG THE "ENAMOURED" SPECIES!

MANY R/C FLIERS, especially if they've gotten into R/C in relatively recent times, will easily recognize the Eagle series of Goldberg trainers. What might not be as apparent is the lineage of these new-generation kits from CGM which, when you expand the acronym, is Carl Goldberg Models. The Eaglet, the Eagle 62 and the Eagle II are the latest in a line of trainers on which more modelers have "earned their wings" than perhaps any others.

The Falcon 56 (both the original and the updated Mk.II) and the Senior Falcon were progenitors of these new birds, and they obviously transferred many of their family traits to their offspring. Good, honest flying qualities, which can be the biggest asset a slightly intimidated budding bird man can have, have been well-preserved. Vastly improved upon, however, are the kits in general, which now walk you through each phase of the model from assembly right to your first flight.

If you're just getting into R/C, or are just looking for a relaxing, around-the-patch, touch-and-go airplane, you might just find these birds of play to be just what you're looking for. ■

READER REPORTS!

We'd like you to participate in our ongoing "Reader Reports" program, which was established to give you, as consumers and our readers, the opportunity to voice your opinions on products you've used. The guidelines are easy: Just send us a brief description (three or four paragraphs) and a picture or two of a kit you've built or have underway. Tell us what you thought. If we use your report in conjunction with one of our regular "Field and Bench" reviews of the same product, we'll award you a complimentary subscription to MAN for your efforts.

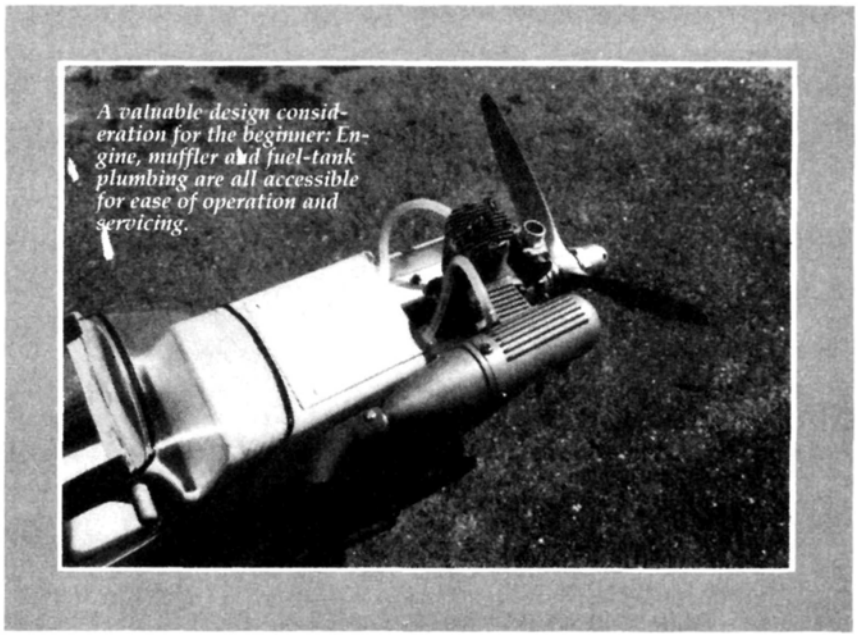
It's that easy.

Participate! Make your views known.

Some of the kits now in the review process:

Hobbico Avistar 40
Century Jet Sport Hawk
Hobby Shack E-Z F-16
Parkinson Regal Eagle
Kyosho Concept 30 heli
CGM Sophisticated Lady
Hobby Shack EZ Dago Red
Yellow Aircraft CAP-10
Hobby Shack Extra 230
Kyosho Express electric
Tidewater Hobby Parakeet
Top Flite Elder Bipe
Midwest Aero Sport 40

CGM EAGLE II *(Continued from page 34)*



A valuable design consideration for the beginner: Engine, muffler and fuel-tank plumbing are all accessible for ease of operation and servicing.

plywood "breakaway" plate, and this assembly, in turn, is bolted directly to the maple bearing members, which are an integral part of the fuselage structure. In the event of severe impact on the nose, this arrangement provides some protection for the engine. I opted for a Royal* .45 2-stroke engine, which is perhaps more power than I needed, but it allows a comfortable cruising speed at half throttle. This feature offers broad flexibility in engine selection.

For covering, I used Goldberg's Ultracote Tan film with iron-on trim of Ultracote Green. I always clean the surfaces of the field color by wiping it with a solvent (acetone, in this case) to remove the oil-like residue left on Mylar films during their manufacture. Thus cleaned, the trim pieces will adhere to the base color more easily.

I have two minor complaints about the Eagle II: The plastic wing-tip parts are only a moderately good fit, and they're cosmetically less attractive than all other aspects of this plane. Perhaps the folks at Goldberg could provide even one more option for built-up wing tips, which could then be covered along with the rest of the wing. The plastic tips are, however, just fine for the novice builder.

My second complaint concerns the decals: They were so brittle that it was difficult to keep them intact as they were being transferred onto the Mylar surface. Goldberg's Dave Patrick acknowledged that the problem was widespread and that they were working with a new supplier to resolve the issue.

PERFORMANCE: Flying the Eagle II was a sheer joy! It balanced out exactly to plan without any component shifting. The first two flights weren't exactly perfect: Each one ended with dead-stick landings from about 200 feet, and the engine conked because of fuel-foaming in the tank. This, in turn, was a result of my carelessness in not providing sufficient padding to minimize tank-compartment vibration. With that problem identified and solved, all subsequent flights have been gentle, trouble-free and *fun!* The Eagle II is a sport/trainer of absolute superiority that's surely destined for "classic" status.

**Here are the addresses of the manufacturers mentioned in this article:*
Carl Goldberg Models, *4734 West Chicago Ave., Chicago, IL 60651.*
Royal Products Corp., *790 West Tennessee Ave., Denver, CO 80223.* ■

Plenty of room for radio gear and a Williams Brothers aviator. The servo-tray position is established by locating the CG.

AIRWAVES

(Continued from page 12)

then proceeded to dork it on takeoff, claiming something to the effect of battery failure, or some such rot. If the truth be known, I believe the cause was reversed ailerons, or some such believable story.

To set the record straight, the Austin bunch is a group of highly motivated, dedicated, sincere, truthful, kind, clean, reverent, sober and handsome individuals who get a big honk out of flying "toy airplanes." If your editor thinks otherwise...well, that dog won't hunt. So there!

GRAMPS
Austin, TX

Dear Gramps, I'll buy the part about "big honk," the rest is STILL questionable. See you in September...with fresh batteries!

ILLUSTRIOUS

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Road, Wilton, CT 06897. Letters may be edited for clarity and length.

SPIRIT OF 74

(Continued from page 24)

brass tubes with fuel tubing. Make certain there are no kinks in these lines. Finish the cross-grain sheeting and sand the completed fuselage.

The tail wheel was built up from a 1/16-inch balsa core with a 5/8-inch O-ring tire and 1/64-inch plywood sidewalls. A small 1/16-inch brass eyelet is the bearing. The tail-wheel bracket is 1/8-inch plywood with the same 1/16-inch brass eyelets for bearings epoxied to a notched 1/16-inch plywood insert on the bottom of the fuselage. It's a very light arrangement and works just fine.

The original was covered with Coverite's* Black Baron film. Follow the manufacturer's instructions for the application of the film of your choice. Use your own method for hinging the surfaces.

Trim the covering away from the stab where it contacts the fuselage and away from the fuselage where the fin is mounted. Epoxy the stab to the fuselage, and the fin and rudder to the top of the fuselage. Check the alignment with a square. Trim the covering away and epoxy the 3/16-inch wing-mounting dowels into place. Connect the rudder to the tail-wheel tiller, as shown.

Fit the canopy into place on the wing center section and mark its location with a soft pencil. Use a straight pin and punch a series of holes through the covering into the wood, just inside the marks. The pin holes should be no more than 1/16 inch apart and located where the canopy sides touch the wing. Their purpose is to provide better adhesive penetration. Spread epoxy or slow CA on the edge of the canopy and glue it right over the pin holes. The canopy isn't necessary, but it does add to the appearance of the airplane.

The engine mount is attached to the fire wall with wood screws, but before screwing it to the fire wall, "harden" the screw holes with thin CA and then paint the fire wall with a coat of epoxy. When the engine is mounted, attach the fuel line to the carb and run a piece of soft iron wire through the throttle Nyrod and connect it to the throttle arm. Bend the landing-gear legs, add the wheels, then mount this unit in the gear mount with metal brackets and small wood screws.

Before installing the radio, assemble the airplane and check the balance point.

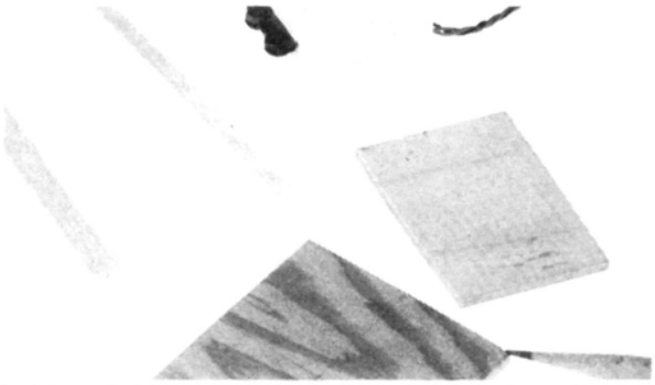
(Continued on page 82)

How To:

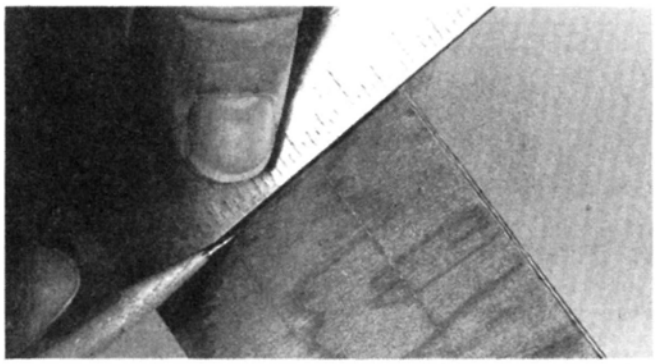
by RANDY RANDOLPH

MAKE A CONTROL MIXER

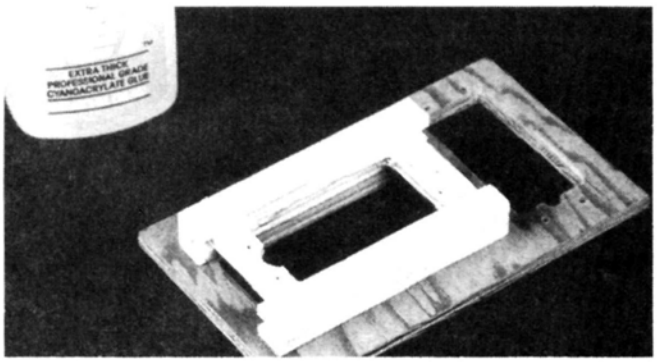
While control-mixing functions are available on a number of modern transmitters, there are literally thousands that don't have that ability. The photos show how to make a sliding-tray mixer that will perform well in any mixing situation.



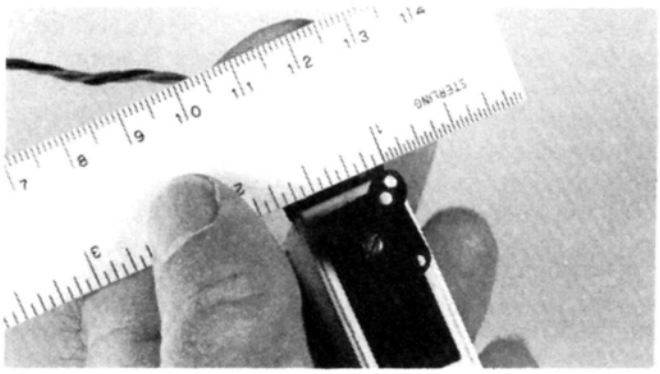
1. *The materials needed are two pieces of 1/8-inch plywood, one 6-inch strip of 1/8-inch square balsa, and one 12-inch strip of 1/8x1/4-inch hard balsa.*



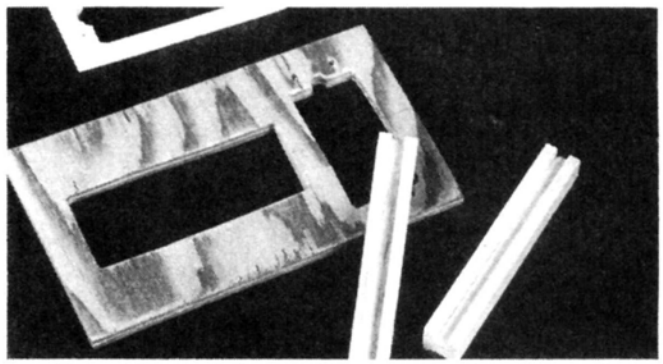
3. *Using a square, mark two cutouts on the ply mount: One is centered on the mount and is 1 inch longer and 1/16 inch wider than the servo; the other, 3/8 inch from the end of the first, is centered across the width of the mount and 1/16 inch wider and longer than the servo.*



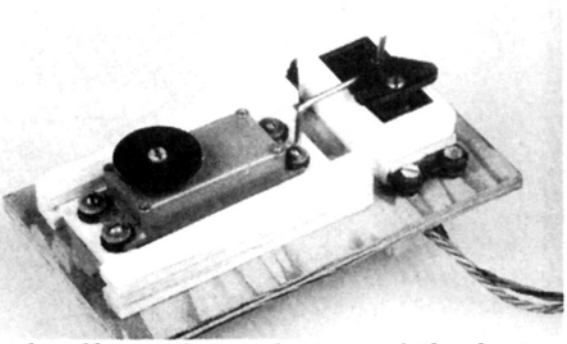
5. *Slip the slider tray between both channels and center it over the long cutout in the mount. Position the channel rails on the mount so that the tray will slide smoothly between them with no side-to-side motion, and glue them to the mount.*



2. *Measure the length and width of the servos. Prepare a plywood mount by cutting it the same width as the area available for mounting. Cut a ply slider tray that's 1 1/4 inch longer and 1/2 inch wider than the servo.*



4. *Cut out the marked areas of the mount and mark and cut out the center of the ply slider tray to fit the servo. Make two "U"-channel slide rails, the same length as the large cutout in the mount, by gluing a 1/8-inch square strip between two 1/8x1/4-inch strips as shown.*



6. *Mount the rudder servo in the slider tray and the elevator servo in the mount. Drill a 1/16-inch hole in the end of the slider tray nearest the elevator servo. Bend a pushrod of 1/16-inch music wire from the servo arm to the tray, as shown. Just below the tray, the pushrod has a 90-degree bend toward the side of the mount. The mixed out put is from both arms of the tray-mounted servo.*

Fifty Years Ago...

by KATHERINE TOLLIVER

The Bell XP-39 Pursuit

ORVILLE WRIGHT once said that the "modern engineers of the aeronautical world are devoting their research more to the design. They are seeking to find new secrets of streamlining and adhering to the principles of air flow." Wright's words certainly rang true years later when 15,000 people gathered at Wright Field in Dayton, OH, (now Wright Patterson Air Force Base) to view for the first time the army's new mystery plane. Unfortunately, this plane continued to remain a mystery for much of the crowd. America's newest fighting plane streaked across the sky so quickly on its initial test flight that many people didn't even notice it!

That plane, the XP-39, was Lawrence Bell's prize package and a product of the Bell Aircraft Company in Buffalo, NY. When the P-39 appeared on *MAN's* July 1939 cover, many of these fighters were already under construction in accordance with President Roosevelt's air-expansion program. The Air Corps ordered 13 Bell XP-39 pursuit planes for $1,073,445.

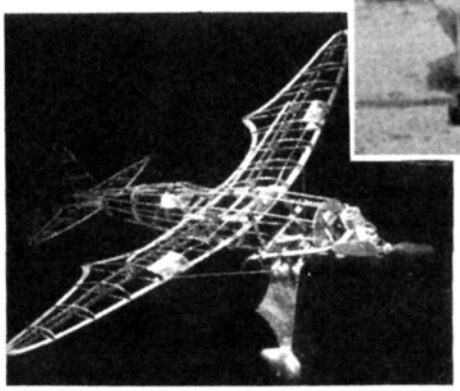
The P-39 was billed as one of the fastest and most maneuverable pursuit planes of its time. Although no Air Corps officer would divulge the exact speed, *MAN* revealed that "according to sources of unquestionable authority, the ship is capable of speeds in excess of 400mph." This graceful little fighter (its gross weight was only 6000 pounds) was a low-wing, all-metal monoplane with some unique design features. Placing the in-line Allison, 1250hp engine in the center of the fuselage made the plane more maneuverable and allowed the propeller to be driven by a long-section shaft that left room forward of the cockpit for four to six guns and an electrically fired 37mm cannon. Drag was reduced by countersinking the rivet heads used to attach the Alcad covering of the fuselage and wing. Another new feature was the tricycle landing gear incorporated with a nose wheel that disappeared into the fuselage. This type of gear always kept the plane in a "flying" position and reduced the distance required for takeoffs.

July's construction articles must have been exercises in frustration. Perhaps the article "How To Build the Dolphin" should have read "How I Survived Building the Dolphin." It appears to have been quite a challenge, both on the workbench and in the air. If you read the first installment in last month's column, you'll recall that the Dolphin disappeared during a test flight. It was only after a search party became well acquainted with several corn fields that it was found 24 miles from the launch site.

In Alfred VanWymersch's construction article, entitled "A Super Streamline Wakefield Model," the first two models were built with bodies hollowed out of balsa block, which proved to be too heavy. Planking the fuselage (a job that was not as difficult as he had anticipated) solved the weight problem and, although the plane was a bit tail-heavy, it flew well. At the Wakefield contest, the plane barely exceeded the minimum weight by a third of an ounce. However, since the model was so new, the very hot weather the day before the contest had changed the weight, settings and balance. After a spectacular climb, the nose block fell out during its first flight of the contest. "This seeming

(Continued on page 42)

A flying scale Boeing B-17 bomber.



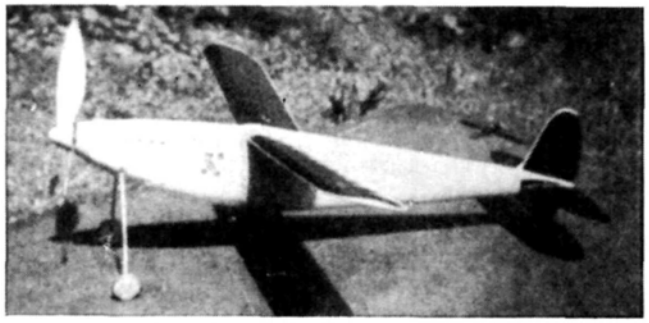
Above: This gas-powered gyro looked great on the ground, but could it fly?

Left: Note structural detail in this metal gas job.

FIFTY YEARS AGO

(Continued from page 40)

cause for the following series of stalls only served to hide that the plane was deregulated, and it was only after the record flight that we woke up and corrected the settings." The plane made a flight approaching 5 minutes. Mr. VanWymersch was forced to conclude, "It does no harm to try out the plane before the contest." (Smart advice, even today!)



Monocoque body and single-blade prop make the Wakefield strong and efficient.

Given the above construction woes, the column "How to Make Your Model Behave" must have restored some self-confidence. This month's topic? How to control the circling characteristics of a model plane when in flight. Altering the downthrust or the vertical fin area were two methods of control suggested. Included were these words of wisdom: "In order to ensure the greatest amount of success at the start, build a plane of simple design." Fifty years hasn't changed that advice either.

Of course, other things do change. Look at these prices in 1939: $3.95 for a Comet Zipper with a 54-inch wingspan, $12.50 for an Atom engine, and 36 cents for *20 sheets* of 18x3x1/16-inch balsa. (Today, one sheet costs 36 cents.)

July provided some great flying weather, judging from the news that was submitted to the "Airways" column by clubs across the country. Mentioned was a model of a Boeing B-17 Flying Fortress that made quite an impression on the *MAN* staff: "This is one of the most remarkable flying scale models that has ever been shown." With a span of 44 inches and attention paid to every detail, it was a show-stopper in the air (even though it couldn't go very far) as well as on the ground. It was also reported that club membership was growing and that many young people were taking an interest in the hobby.

An unusual design was featured in the "Gas Lines" column. A metal, gas plane was built in complete detail by Robert Johnson of Los Angeles. Made entirely of 14-gauge Dural, it was of knock-down construction throughout and, when powered with a Forster Brothers engine, the total weight was 8 pounds, ready to fly. In an effort to break the suction over the wing's airfoil created by airflow, a point was placed on the center of each wing. With a 5-foot wingspan and a wing loading of 1.6 pounds per square foot, Mr. Johnson claims that it could reach speeds of up to 50mph.

No performance claims were made by the modeler who sent in a photo of his autogyro. Getting a gas-powered autogyro airborne would have stopped the presses at *MAN*, but this guy wasn't talking. Although autogyros had been designed and built by others, flying them was another story.

According to the "Flash News" column, 1939 was a good year for American Airlines. American's revenues were up 32.4 percent. It looks odd to see the word "up" in the same sentence with airline revenues. Also mentioned was the fast, Curtiss P-36A fighter that was assigned to Charles Lindbergh for his extensive nationwide inspection of aircraft research and production facilities.

From Australia came a report of air combat of a different kind. A bird, thought to be a large magpie, engaged and downed a glider at about 1,500 feet. A case of violation of airspace, perhaps.

MAN was well in tune with worldwide events when it expressed its thoughts on the prospects of war in terms that any modeler could relate to: "Clogged carburetors to high military and governmental officials who scoff at the prospect of war and the necessity of building our air force into a mighty, omnipotent, defensive force." Those July skies that had provided such good flying weather for modelers were soon to turn dark and ominous, as the threat of war moved closer. ■

ROBBE ASW 24

1ST PLACE 1989 WRAM SHOW

by SAL IASILLI

An award-winning glider built from a highly pre-fabricated kit, spans over 11 feet!

ROBBE'S* ASW-24 is a 3.5-meter scale model of the newest standard-class design from the world's leading sailplane manufacturer, Alexander Schleicher from West Germany. The plane's wide cabin and the wing geometry are maintained in this attractive scale

Left: Languishing in a field of winter grass, the ASW, complete with scale pilot figure, awaits the tow line. Large-scale sailplanes closely approximate the flying qualities of the full-size ones.

SPECIFICATIONS

Type: *Robbe ASW-24*
Wingspan: *11 1/2 feet*
Length: *5 feet*
Weight: *7 pounds, 12 ounces to 6 pounds, 8 ounces*
Number of Channels Required: *minimum of 4*
Wing Area: *973 square inches*
Tailplane area: *100 square inches*
Total Surface Area: *1,073 square inches*
Airfoil: *HQ3.0/13-10-13*
Sug. Retail Price: *$279.95 plus $29.95 for spoilers*

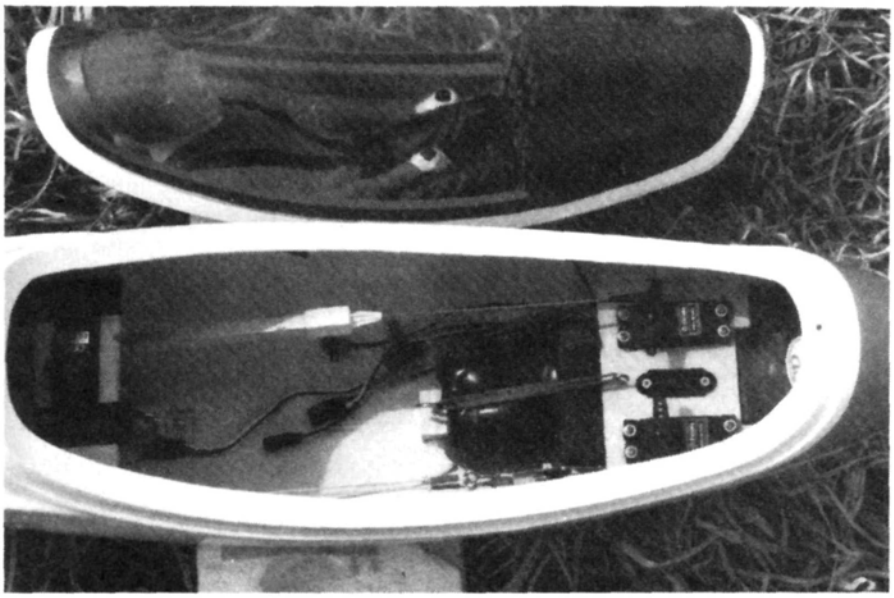
Review Model
Weight: *7 pounds*
Finish: *Formula U and EconoKote*
Radio: *Futaba 8-channel PCM*
Controls Used: *Elevator, rudder, ailerons, spoilers, flaps*

PHOTOS BY SAL IASILLI

model. The cockpit has space for radio equipment and a scale interior that includes a pilot figure.

I first saw the ASW-24 in a Robbe advertisement that showed a young man holding this beautiful scale sailplane on a hilltop overlooking a valley somewhere in Germany. The more I looked at the photo, the more interested I became in building this sailplane. I called Robbe to find out if a built-up model of the ASW-24 would be on display at the upcoming WRAM show, which was a few weeks away. I was assured that Mr. Frank Heinrich, president of Robbe, was trying his best to have the model completed in time for the show. When show time finally came around, I went directly to the Robbe display booth and feasted my eyes on one of the best-looking sailplanes I'd ever seen! After asking a myriad of questions about the kit, I handed Mr.

ROBBE ASW-24



With the canopy removed, access to radio equipment is great. Even the switch is located internally to reduce the drag usually associated with mounting it through the fuselage.

Heinrich my "plastic" and ordered the ASW-24 on the spot, along with the recommended spoilers. I was told the kit would arrive within a week or so and, two weeks later, it *did*.

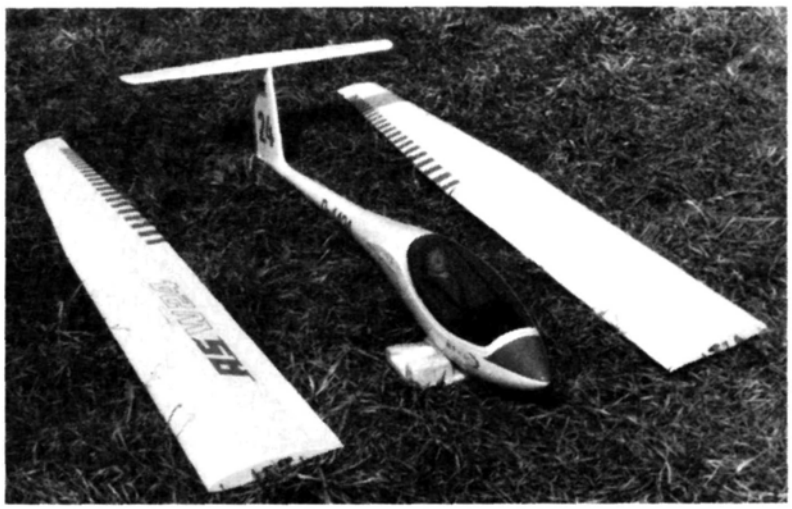
THE KIT: To say I was impressed with the kit's contents would be an understatement: The packaging was one of the nicest I've seen. The wings were packed in their own box and in plastic bags inside that! All the parts, including the fuselage, were labeled and in neat plastic bags.

The kit includes a pre-molded Plura fuselage with a molded-in rudder fin and cabin base, a molded-in wing and tailplane fairings to minimize drag. There's also a molded cabin interior insert with a scale pilot, and all this is compatible with most common modeling glues and paint. The wings are made of expanded styropor foam cores and have full-length spars laminated with PU foam and balsa veneer. They're also factory-sanded with the ailerons pre-slotted and the spoiler bays pre-milled. The cable-guide tubes are also installed. The wings use flat steel rods for the mounting system, and clamping mechanisms keep the blades in place. The stabilizer is pre-shaped, lightweight balsa, and the rudder is built-up, sheeted balsa. Pushrods, hardware, decal set, detailed plans and instruction booklet are all included. The only recommended accessories are the 10-inch spoilers. (I used the 12¾-inch spoilers; part No. 5002.)

ASSEMBLY: Although Robbe says the kit is ARF (almost ready to fly), a lot of time-consuming assembling must be done before you can get this bird into the air. The assembly and operating-instruction booklet is in three languages (German, French and English), and there's also an extensive parts list.

The assembly sequence is very important in this kit. Refer to the plans, building instructions and parts list to ensure that you fully understand each stage of assembly before proceeding. Robbe recommends that you begin with the fuselage, which has a seam—a result of the molding process. The instructions suggest that you remove the seam with a sharp balsa knife. Instead, I chose to sand it smooth, then I filled any imperfections in the seam with body putty, primed it and then painted it with Formula U* spray paint.

Stage 1: The cabin dome area is removed, and it takes quite a bit of scoring with a sharp X-Acto knife before this can be accomplished. Next, the rear opening in the fin is filed out, followed by gluing all the recommended half-rib wing-root fairings and recommended bulkheads into position. All this can be done with any thick CA and accelerator spray. At this point, you also have to install the wing-joiner assembly and drill the recommended holes that have been pre-marked on the fuselage. Take your time with this and follow the alignment, which is discussed thoroughly in the instruction booklet.

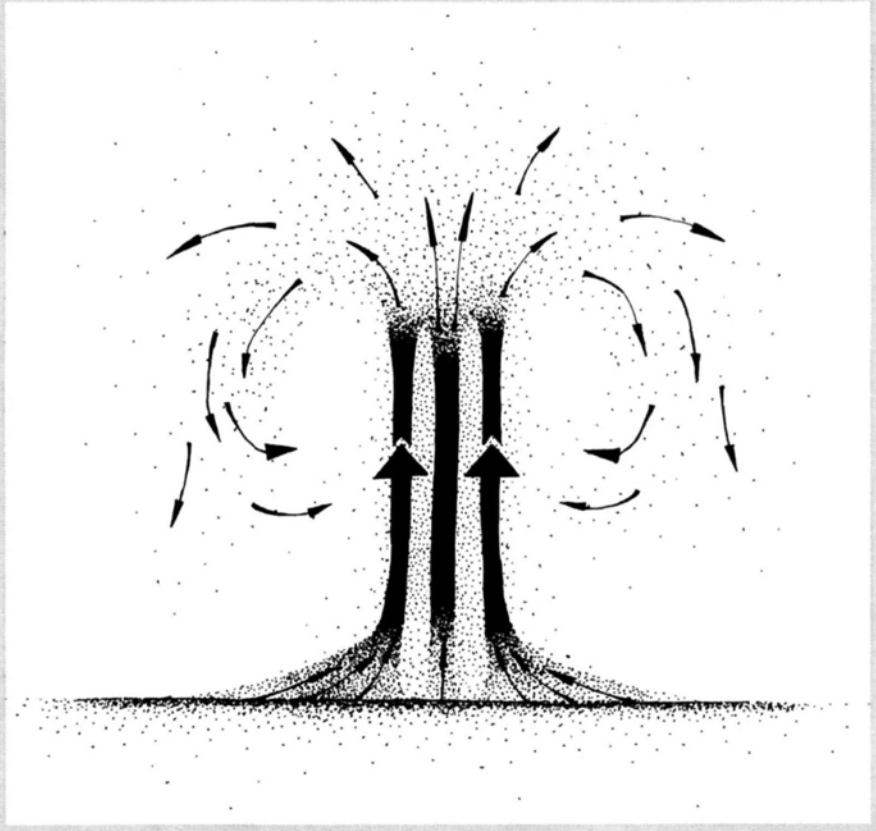


Broken down for transportation, the ASW still represents a large, but very manageable, package.

Stage 2 involves the elevator crank and rudder linkage. I moved the eleva-

WHAT'S A THERMAL?

From our forthcoming glider book by Alan Gornick



Thermals are formed as a result of differential heating of the earth's surface. The most common heat source for thermal production is the sun, although some manmade sources, such as a heated chicken shed in winter, or a steel mill almost any time, can produce thermal activity that's useful to model glider pilots. For the moment let's consider only the effects of the sun. As the sun shines on the earth's surface, different areas absorb the radiant energy it provides at different rates. As a particularly heat-absorbent area warms, it transfers its heat to the air above it, which begins to rise. As this air from the warmed area rises, cooler air from the surrounding terrain flows in to replace it, and this is, in turn, heated so that it rises aloft. In the absence of wind, this heated air will be carried aloft in a vertical column that continues to rise and expand until its temperature is reduced to that of the surrounding air. If the air is sufficiently humid, this expansional cooling will lower the temperature to the dew point and a cloud will be formed. In any case, this now-cooled air will start flowing downward to replace the cool surface air flowing into the thermal, which is in turn being heated and is replacing the hotter air being carried aloft. Since, on a large scale, the areas producing thermals will be only a small proportion of the total area, the updrafts, or lift, in the thermals will be much stronger than the downdrafts, or sink, in the surrounding area. This process will continue until something like wind, or a cloud's shadow on the ground, interrupts the heat source.

A thermal rising in a continuous column (as already described) is called a chimney thermal, and in the presence of strong, continuous heating, it's the most prevalent type. ■

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tor and rudder servos further forward than was recommended on the plans, so I needed a longer pushrod. I also chose to use pull-pull Kevlar cables from Sullivan Products* for the rudder servo.

In Stage 3, the stabilizer is carefully fitted to the fin mount and held in place with a screw that's drilled and tapped into the fin and kept in place with an alignment pin that's aligned to the wing, measuring from the tip of the stab to the tips of the wing blades. This is fully illustrated on the plans and explained in the instructions.

Stage 4 consists of building up the rudder with sheeting and ribs, while Stage 5 involves fitting the canopy to its frame and painting the pilot figure, followed by the preparation of the wing panels. At this time, you must decide if you want to use spoilers or flaps; I chose to use both.

Another drag-saving feature: the rudder's pushrod exit uses a streamlined fairing.

To assemble the wings, the leading edge is glued and sanded to the template shape on the plans. The wing tips can be made straight out or drooped down (the latter is to scale, but requires more work). The wing blades and plywood rib roots are also epoxied at this stage.

I chose to install the aileron servos in the outer wing bays using silicone rubber cement, and this worked very well. The inner wing bay accommo-

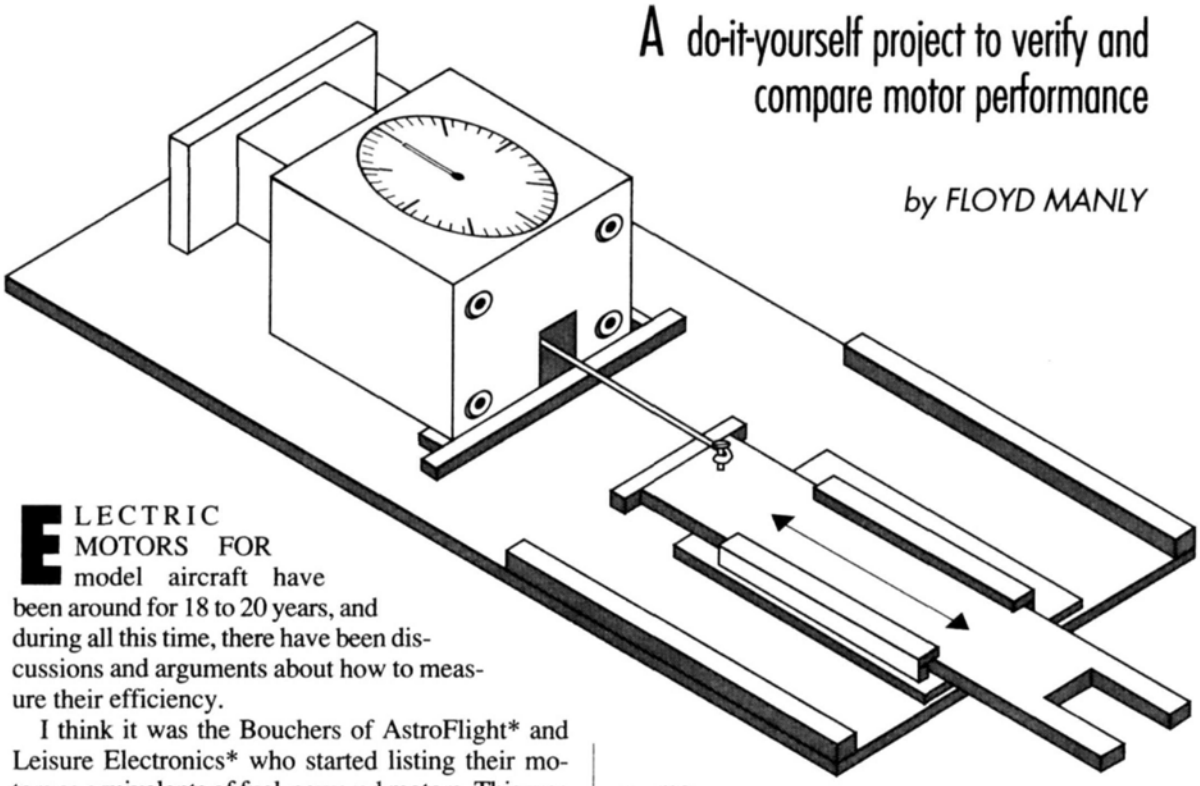
(Continued on page 99)

Build an Electric Motor

Thrustometer

A do-it-yourself project to verify and compare motor performance

by FLOYD MANLY



ELECTRIC MOTORS FOR model aircraft have been around for 18 to 20 years, and during all this time, there have been discussions and arguments about how to measure their efficiency.

I think it was the Bouchers of AstroFlight* and Leisure Electronics* who started listing their motors as equivalents of fuel-powered motors. This was a reasonable classification of motor size and as good as any other method. Others argued that designations of 05, 15, or 40 are nonsense, and that electric motors should be sized by their wattage.

Both schools of thought have their merits, but they also have their shortcomings. When likened to a fuel motor, the designation gives no indication of the size of aircraft a particular motor should be able to power adequately. When the power of the motor is measured by the electric term of watts, you have a truer measure of the motor's output, but few people are conversant with these terms, so the discussions and arguments will continue.

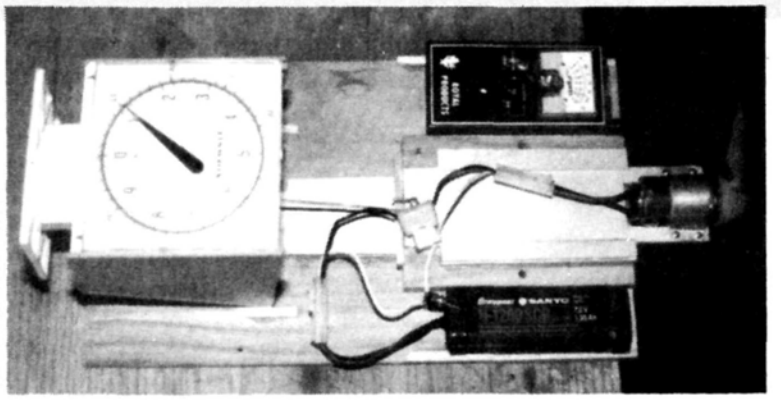
Meanwhile, how about another measuring system that disregards fuel, power and size and ignores watts, volts, amps and ohms. (Is one .40 as powerful as another? Not by a long shot.) How about measuring for effective thrust, which is the actual pulling power of the prop?

Even this method has so many variables that it could be considered inconclusive if used for anything other than a comparison with other electric motors. Two attributes that really determine whether a motor is useful to your application or not are thrust and duration.

Among the variables that can affect claims made for a particular motor are: battery voltage, amperes, method of battery charging and prop profile. The right combination of these variables will determine the maximum power available. A useful "rating" is found by asking: What's the maximum pulling power, and for how long will it pull? One combination might be able to pull a ton, but only for a couple of seconds. Another might be able to pull only 1 pound, but will do it for 1 hour. Somewhere between these extremes is a combination that will be useful to your application.

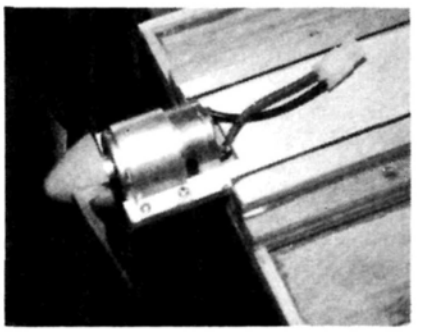
My "thrustometer" started as a "breadboard" model to test my basic concept. Its simplicity is evident, and its effectiveness made me realize that any refinements would be superfluous. It works!

The material should all be available from your scrap box or your local hobby shop. The motor is clamped onto the simplest of sliding mounts. I used a clamp, but you could get by with two or three rub-



PHOTOS BY FLOYD MANLY

Above: Complete test rig is easily constructed and provides the capability for comparative testing of various motor, prop and battery combinations.



Right: Typical test configuration has motor clamped to sliding mount plate, which is connected to direct reading scale.

ber bands. The mount slides between two rails. Friction that might cause a hang-up is relieved by tapping the mount while the motor is running. My model has "nests" for the tachometer and batteries, but they aren't necessary.

The thrust meter is simply a hardware-store scale with a 0- to 160-ounce range. Postal scales "top out" at 16 ounces, which is too low even for "05" motors. Most available scales are in the 0- to 25-pound range, which is too high to get any kind of consistent accuracy. The scale in the photo is a Soehnle from West Germany. I don't remember where I got mine (it's about 10 years old), but check with your local office-supplies store. I only needed to cut a hole in its base to attach a wire from the scale's mainspring to the sliding motor mount.

Include in your wiring harness enough connections to attach various batteries and motors. A switch will enable you to turn the power on or off with one hand while you're writing down the results of your tests. Any tachometer will do, but an optical-reading LCD type would give the quickest and most accurate results. An LCD stopwatch would be excellent, but a digital wristwatch is acceptable.

A sweep-hand watch could be used, but not with any certainty of accuracy. A direct-read tach (the kind that has to be pushed against a spinner) won't work, and unfortunately, a photoelectric tach can't be used after dark. (They read the light bulbs in your shop!)

All tests must be run several times so that you can average the results. For accuracy, establish a base line that can be used for comparison. This base line of the same motor/battery/prop combination should be run before each test session to verify that it hasn't changed, or to establish a new base as circumstances require.

There ya go! Now you have the "machine" with which to compare one motor with another (if you use the same batteries and prop on each), and you can now check which prop is best for a particular motor, or you can effectively "design" the best motor/prop/battery system for your application.

I'd be willing to bet that after just a couple of test comparisons, you'll be the "electrics expert" in your club. Accurate test results require consistent recharging of your batteries and adequate break-in of the motor brushes, but of course, you *know* that! All you needed was a method of proving what you already knew.

**Here are the addresses of the companies mentioned in this article:*
***AstroFlight Inc.**, 13311 Beach Ave., Marina Del Rey, CA 90292.*
***Leisure Electronics**, 22971 B Triton Way, Laguna Hills, CA 92653.* ■

R/C on a Budget

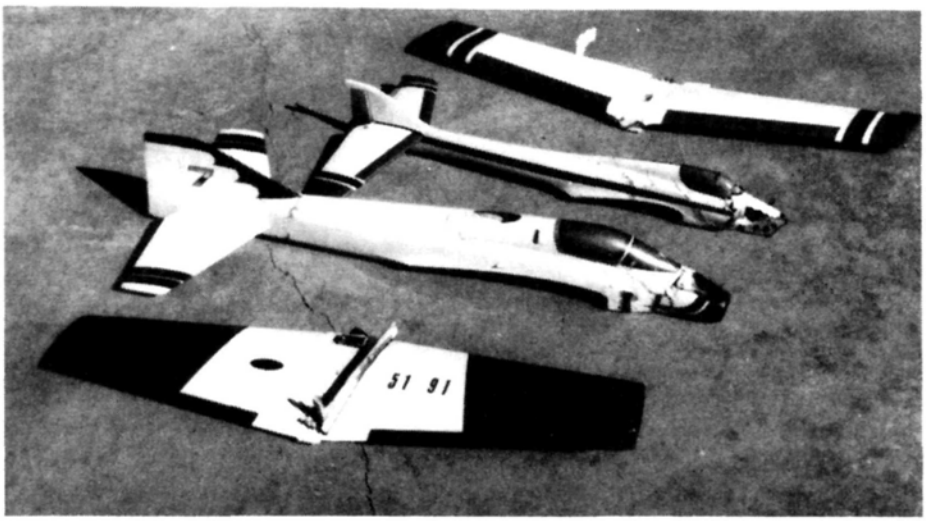
Gliders are great candidates for rebuilding projects, since many of them are of all-balsa construction and require no special materials to repair.

There are some real bargains out there; all it takes is some time, initiative and minimum bucks.

by GEORGE VOSS

"SOME PEOPLE HAVE all the luck!" "I can't believe you *did* that!" "George, they'll get you for stealing!" "You're cheap!" Yes, all these things (and more!) have been said about me and my hobby. You see, I'm not one of those who have an unlimited budget for my hobby: On the contrary; my budget is extremely tight.

But even though I'm cheap, I'm not underprivileged. Let me tell you about a few of the items I've acquired lately: a Multiplex Flamingo contest glider (sells for about $250); an EU-1A pattern plane (sells for about $150); an Airtronics XL-6 radio (sells for about $165). I paid only $150 for *all* these! You don't believe me? But I did! How about another EU-1A and an Equalizer II pattern plane. If I told you they were *given* to me, you'd probably think I was lying, but I'm not!



A broken air force at the moment, these castoffs were carefully rebuilt. Any club field is a great source for leads.

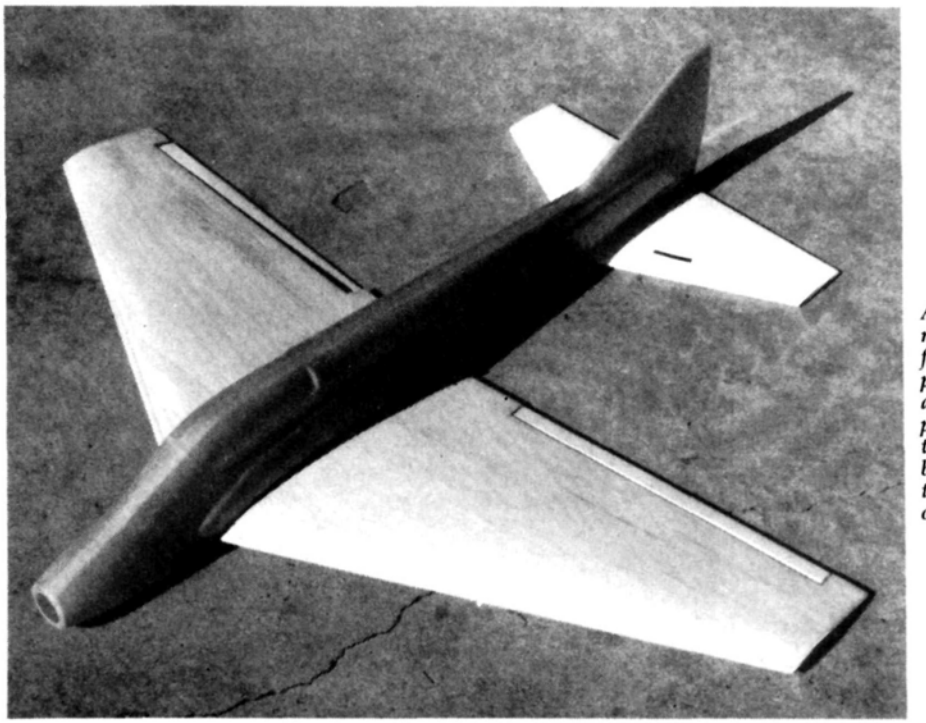
Now I must clarify something: When I received several of the aforementioned items, they weren't in what you'd call "mint" condition. The Flamingo had two broken wings, and one of the EU-1As and the Equalizer had damaged nose sections forward of the canopy. Were these planes "flyable"? Not on your life! Were they repairable? You bet! I assure you, though, their previous owners had doubts when I said I could fix them!

I'll tell you how to have fun in this hobby on a very limited budget. As a matter of fact, even if you're the tightest tightwad, you can still have a blast for very little money!

Being cheap does have it's drawbacks. I don't usually fly the most modern airplanes equipped with fancy radios and high-powered engines. Most of the items I pick up are out-of-date or damaged (some, severely). They usually need several hours of work, and the repairs sometimes take longer than it took to build the airplane the first time. But, for me, this is a "hobby" first and a "sport" second, so I don't mind building. (I'm one of the two people on the left when you ask for "Fliers on the right, builders on the left!")

Obviously, the financial benefit of picking up used, out-of-date or damaged equipment is great, but the greatest advantage is the satisfaction that results from knowing that you've taken an inoperable airplane (just damaged, or a box full of sticks!) and made a flyable airplane out of it. I had the biggest thrill when I showed up at the glider field with a repaired Flamingo and the ex-owner said, "That looks great!" Another person wanted to know if that was the plane so-and-so crashed and asked, "What did you do? Get another wing?"—"No, I repaired it! If you look closely, you can tell where I made the repairs. It doesn't look as nice as it did when it was new, and it did gain some weight, but I don't have any less fun with my 'phoenix' ships than others do with their

PHOTOS BY GEORGE VOSS



An EU-1A resurrected from the junk pile, acquired at a bargain price. Sure, it took some rebuilding, but that IS part of the hobby!

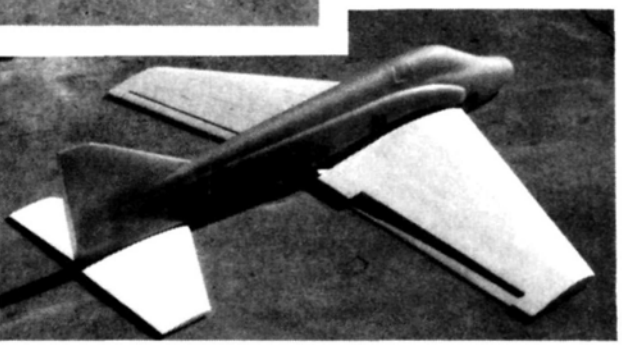
big-buck ships."

By now, I'm sure that you're wondering where I found these"deals." It's no secret, but it does take some leg work to find them. I check for bargains in local newspapers, bargain-type papers, at swap meets and at garage sales; but by far the most productive places are the flying field, the local hobby shop and the model magazines.

First, let others know that you build and repair airplanes; I told my local hobby shop owner that I do that sort of work. He sends me people with items to sell and, in return, I buy the necessary parts from him (a sort of you-scratch-my-back-and-I'll-scratch-yours deal!). Talk to all the modelers you can find, and spread the word that you're interested in their airplanes.

This brand-new, in-the-box Kraft .61 engine was bought as part of a package that included airplanes and other equipment for less than $100!

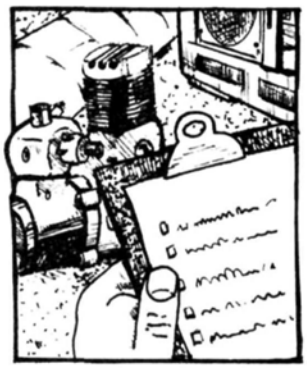
Let me give you an example of how this all works. In the hobby shop recently, I was telling Mike (the man behind the counter) about an EU-1A that I'd found for $50 in one of the modeling magazines' "Classified" sections. He began to tell me about his experiences with this ship and said that many other local people really liked this plane. In fact, he knew a man who had recently crashed one and had just bought another. I asked about the damage, and Mike said it was pretty bad, but his eyes lit up as he said, "You can fix it, though!" He also told me about another damaged pattern plane and gave me the phone numbers of the owners of both planes. When I called them to ask what they planned to do with the planes, they both said the damage was too great for them to try to repair, but if I was interested, they would *give* them to me! I think they *could* have repaired these ships, but what they were *really* saying was that their hearts weren't in them anymore, and if I'd be kind enough to take them out of their garages, they'd appreciate it!—So I did!



Let me give you another example. Some time ago, someone at work told me he was once involved in the hobby, had gone on to other things, but still had hobby-related items in his attic. He said he thought it was all junk, but I was welcome to it. His attic provided an Ace Shrike Commander (with two brand-new Cox TD .051s installed in the nacelles), a Goldberg Falcon and a brand-new RJL .60, still in the box! He said he'd forgotten he had the engine. To make a long story short, I gave $30 for all this, *plus* some old covering material and miscellaneous hardware.

I also found someone who wanted to sell his airplane items for $100, because he's now interested in cars. Another gold mine! A Futaba 6-channel radio with nine servos (five worked well, two intermittently, and two didn't work at all); an EK single-stick 4-channel brick (two brick functions didn't work); a Heath single-stick 3-channel (no servos); several airplanes (the biggest was a ready-to-cover Bud Nosen trainer). As I'm cheap, I offered him $75, which he gladly took. As you can see, just by asking a few questions, I was able to pick up several excellent bargains.

(Continued on page 102)



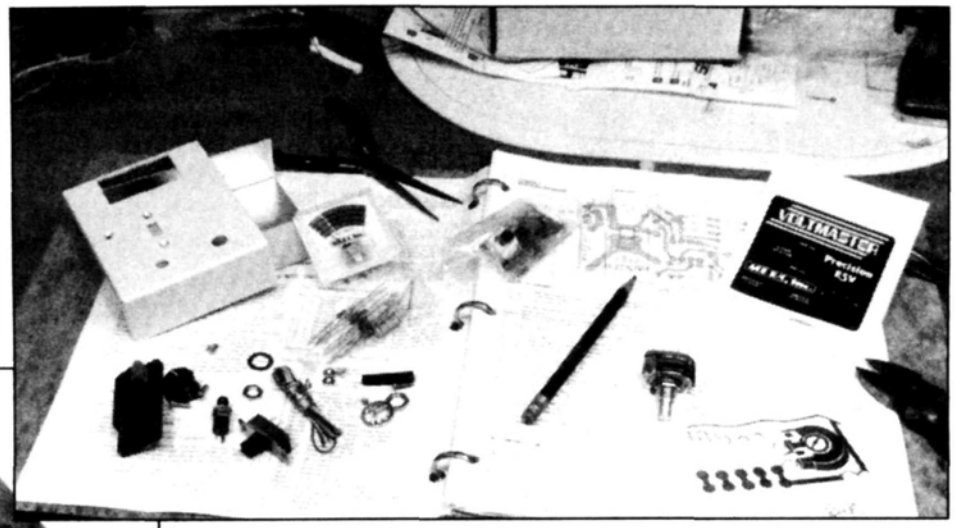
Mini-Val

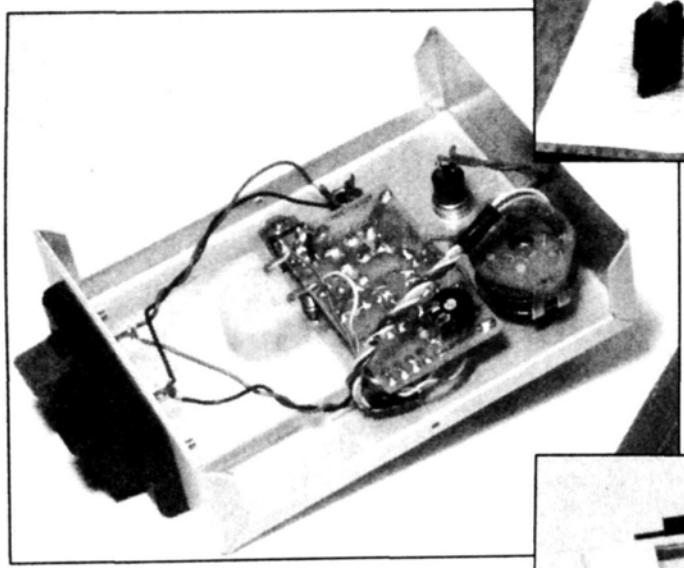
by JOE WAGNER

Takes a quick look at Ace R/C Voltmaster

WHAT WOULD YOU be willing to pay to own a simple-to-use gadget that could eliminate the second most common reason for crashing R/C airplanes? Would it be worth $40 to you? How about $30?

An inexpensive crash preventer





Above: Ready to begin assembly of the Voltmaster kit. The loose-leaf notebook holds Ace's step-by-step instructions, which make the job easy.

Left: All assembled and ready to close up the case! The whole job took less than 2 hours. (Note the mini jack socket at top center—my own modification, and one that caused a minor problem.)

Below: The Voltmaster in use on author's Silver Seven transmitter. (The meter needle's in the red only because the energize button isn't being pressed.)

Those are the respective prices (approximately) for the assembled-and-tested instrument and the do-it-yourself kit for Ace R/C's* Voltmaster meter. It's the best tool I know of to make *sure* your R/C system's batteries are good before flying. The Voltmaster is easy to use, and it can—and should—be employed before every flight to be certain your batteries contain sufficient electrical power.

The Ace Voltmaster is an expanded-scale meter. That is, its indicator amplifies the portion of the voltage scale that you're most interested in, e.g., from 4.5 to 6.0 volts for receiver battery packs. At the same time, this meter applies a simulated operating load to the battery that's being tested, so you can see the actual working voltage available to run your radio system when your model is in the air. If that looks questionable, you can recharge (or replace) the low battery pack, thereby avoiding an expensive crash or flyaway.

Of course, expanded-scale voltmeters aren't new. I have a Heathkit meter that I'd been using for nearly 15 years before I retired it in favor of the Voltmaster. I did that because the Heath meter only works on 4.8V Ni-Cd packs, and I could only check 4-cell receiver batteries with it. The Voltmaster is far more versatile. It has four voltage scales (4.5 to 6.0, 6.5 to 9.0; 9.0 to 12.0; and 11.2 to 15.0) that make it useful for just about any sort of

(Continued on page 54)

ACE VOLTMASTER

(Continued from page 52)

R/C equipment available, including transmitters, most of which operate on 9.6V.

Besides the number markings on the Voltmaster's scales, the green, yellow and red areas printed on the meter face provide easy-to-interpret "go/no-go" information. If the needle's in the green, go fly. If it's in the red, *don't!* And I interpret a "yellow area" reading to mean, "Why take a chance? Recharge already!"

The ability to check an R/C transmitter's battery power is important to those of us whose built-in transmitter meters register radio-frequency output rather than battery voltage. (Airtronic transmitters are of this sort.) Here's how to tell the difference: Turn the transmitter on with its antenna collapsed and note what the meter reads, then extend the antenna. If the meter needle moves up-scale, it's registering RF output instead of battery voltage.

I've been happily using my Voltmaster for over a year now. I built it myself from the Ace R/C kit, and I've had only two minor difficulties. One was my fault: I like to use miniature "phone jacks" to connect the test leads to my meters, and for this purpose, I installed a mini jack socket in the face of my Voltmaster. I didn't realize that grounding the negative battery lead to the meter case is a no-no in the Voltmaster. Its solid-state electronic design requires that the case be kept electrically isolated from both the battery lead wires. The folks at Ace R/C corrected my error for me, and told me exactly what I'd done wrong so I wouldn't repeat my mistake.

The other problem I had was caused by a minor design deficiency. The rotary switch that's used to change from one voltage range to another requires a fair amount of force to turn—so much that its knob setscrew works loose on the switch's round shaft, and the knob twists out of position.

I fixed this easily enough, though. I put a dab of red paint on the tip of the setscrew, then carefully oriented the knob on its shaft and tightened the setscrew as tight as I could. Then I loosened it, gently removed the knob, and used the paint mark on the switch start as a locater for a flat area that I made on the shaft with my Dremel grinder. The flat now gives the knob's setscrew a firm "bite," and I've had no further trouble with the knob slipping out of position.

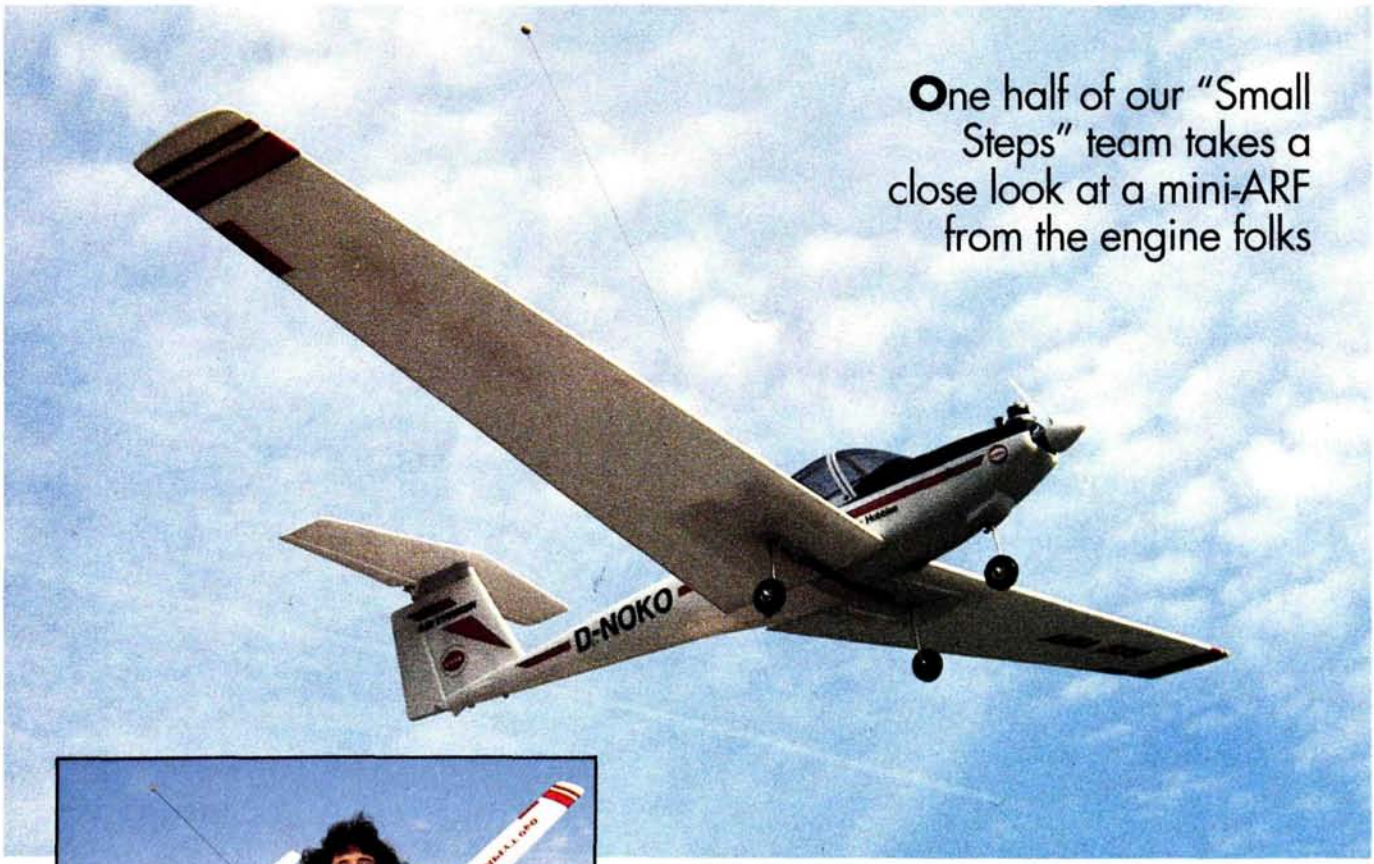
**Here is the address of the manufacturer mentioned in this article:*
***Ace R/C Inc.,** 116 W. 19th St., Box 511C, Higginsville, MO 64037.* ■

COX HOBBIES

1/2A TYPHOON

by JOE WAGNER

One half of our "Small Steps" team takes a close look at a mini-ARF from the engine folks



PHOTOS BY JOE WAGNER

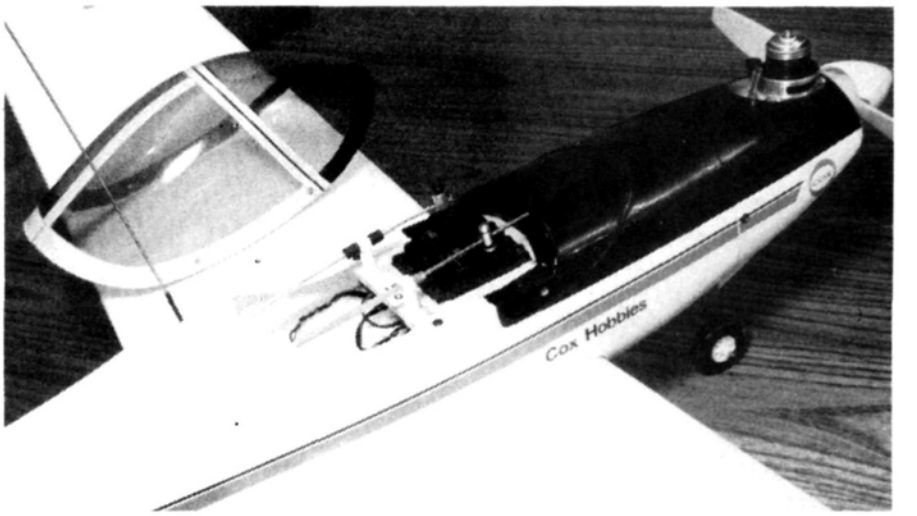
COX'S* NEWEST ARF R/C airplane is a 1/11-scale replica of the German Taifun two-place motor glider. When assembled, it's a beautiful and impressive model; it's every bit as pretty as the one shown in the full-color photos on its kit box.

THE KIT: The first thing you notice when you open this kit box is a diamond-shaped yellow warning sheet like a "Slow" traffic sign. It advises that if you aren't an experienced R/C pilot, you should *not* try to fly the Typhoon without help, or you'll surely crash it. This warning really means what it says! Although I'm by no means a hotshot R/C flier, I'm fairly well experienced

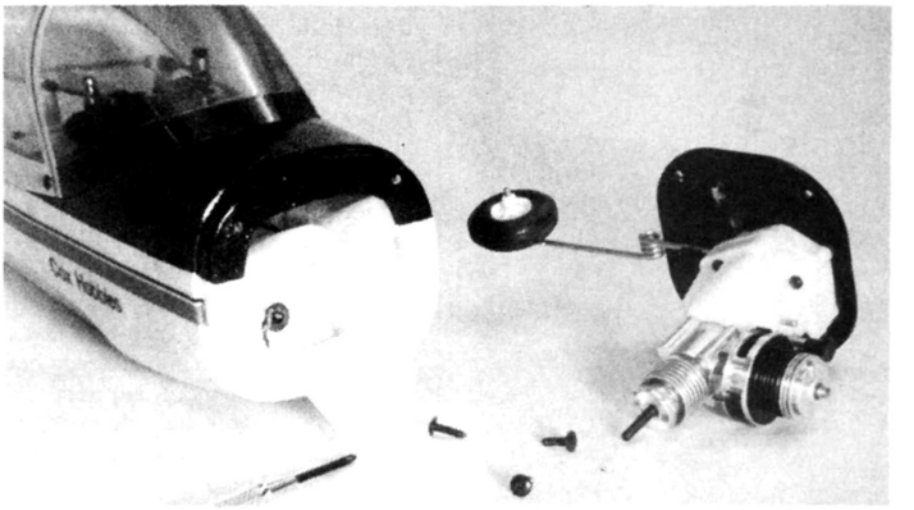
Above: With its dihedral increased to 7 degrees (by rebending the wire wing joiner), the Typhoon looks more like the pictures on the kit's box. In flight, it's far more docile in turns than with scale dihedral.
Left: Diana Joseph with the newly assembled airplane. Note its rather flat dihedral: close to scale, but not so good for 2-channel flying.

SPECIFICATIONS

***Type**: ARF 1/11-Scale Motorglider*
***Span**: 64 1/2 inches*
***Wing Area**: 310 square inches (see text)*
***Weight**: 26 1/2 ounces*
***Wing Loading**: 12.4 ounces/square feet (see text)*
***Length**: 29 1/2 inches*
***Power Required**: .049 (furnished)*
***Number of Channels Required**: 2*
***Sug. Retail Price**: $199*
***Features**: Everything furnished in kit, except radio system; no adhesives needed.*
***Comments:** A very attractive, small-field-capable motorglider. Thin airfoil section is susceptible to tip-stalling, but this isn't a problem if recognized. Minor changes produce a pleasant airplane*



Servo installation, with the revised rudder pushrod at right. The canopy is held on with four tiny screws. Note the painted anti-glare area. The furnished decals just wouldn't lie smooth.



Installing the battery and receiver through the nose is much easier than stuffing them blindly forward from the cockpit area. Note the poly-foam cushioning: good protection without bulk.

in the game, and I *crashed* my Typhoon on its *second* flight.

Before getting into the flying characteristics of this model, let's look further at the kit and its assembly procedures.

The Typhoon comes with everything you need to complete it, except the radio system. The engine is one of Cox's justly famous .049 reed-valve motors, complete with large fuel tank (over 7 minutes running time), muffler and spring starter. The rest of the kit is made in Japan by Kyosho*, the company that's the world's largest manufacturer of plastic R/C planes, cars and boats. (Except for its powerplant and color scheme, the .049 Typhoon is identical to Kyosho's electric-powered Express.)

The Typhoon is all plastic, with a blow-molded fuselage, canopy and cowl; and flying surfaces are of foam plastic with a thin, smooth, external skin. (The wing covering appears to be MonoKote*.) For an all-plastic scale model, the Typhoon is rather light. Ready to fly, with a 2-channel Cox Cadet radio system aboard, the all-up weight is just over 26 ounces. It would be difficult to build an all-balsa model this size much lighter than that.

My kit was one of the first ones made, and some of the parts didn't fit together well. The main problem was mismatching holes. The Typhoon has no adhesive joints; everything is assembled with screws (except the wings, which slide onto a bent-wire center joiner and are retained by a rubber band on the underside).

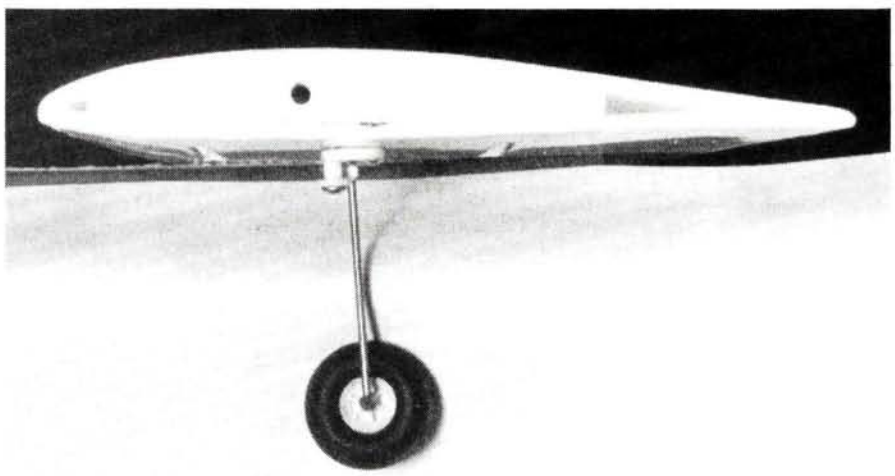
I notified the folks at Cox about the discrepancies I found in this early kit, and by the time you read this, they've probably fixed them. (For my model, I made the necessary corrections.)

A 17-page instruction manual describes the assembly and flying techniques in detail. It's quite important to read this all the way through before beginning assembly. It will give you a good overall view of the project, so you'll understand the interrelationships between the components. There are also three "trees" of injection-molded plastic parts, which aren't identified in the manual until page 16.

CONSTRUCTION: In general, I followed the Typhoon's instructions precisely, but I did find a few places where variations seemed advisable. To begin with, before doing any assembly, all the edge "flash" should be carefully cut away from the plastic parts with a sharp blade, or some of them won't fit together properly.

The instructions call for an "awl" to be used for making starting holes for some of the assembly screws and a 1/16-inch drill for others. Because these screws are so small and are all that hold the model together, I wanted to make sure they had the best possible "bite" in the soft plastic into which they screw. Thus, I used a sharpened piece of 1/16-inch music wire instead of an awl (which has a point that's too big and

(Continued on page 58)



The Typhoon's wing root displays the thin Eppler airfoil. The hole is for the wire wing joiner—the only structural member holding the wings and fuselage together.

blunt) and a No. 55 (.052-inch-diameter) drill in a pin vise instead of the 1/16-inch drill. The additional ten-thousandths-of-an-inch material with the smaller holes may not seem like much. However, it guarantees a much better "bite" for the screws, some of which—such as those on the cowl and canopy retainers—require removal and replacement periodically.

Control-horn installation is more of a trick than the instructions indicate. The horns are retained by snap-type fasteners, and to get these in place, you have to compress the inner foam quite a bit in both the rudder and the elevator. I couldn't do the job with finger pressure alone; but a small nut-driver made a handy tool with a firm bearing surface to push the snap fasteners into position.

Some of the decals must be applied early in the Typhoon's assembly. They're actually pressure-sensitive stick-ons, and their adhesive is extremely aggressive. To avoid ruining them by improper positioning, I used a slightly different application technique than that called for by the manual. I cut around each decal, leaving about an 1/8-inch margin. Then I peeled the backing paper away from one corner about 1/2 inch and cut it off. Next, I placed the decal over the part it was to decorate, and I carefully adjusted its position until I had it right. Finally, I pressed down on the decal's unbacked corner to anchor it, then I lifted up the "backed" portion so I could peel away the backing slowly with one hand, while gradually pressing the decal into place with the other.

The Typhoon's decals are somewhat flexible and can be stretched slightly, but I wasn't able to make them work for the "anti-glare" areas on the fuselage and cowling. In spite of the decals for these being made in three pieces each, the compound curvature involved was a little too much for the decals to cover smoothly. I burnished them down into place again and again, only to have them repeatedly work loose in local "blisters."

I solved the problem by discarding the anti-glare decals and painting these areas on the model with black plastic-model enamel. To ensure adhesion of the paint, it's advisable to wash the parts thoroughly with detergent and hot water. (A little scouring with Ajax cleanser on the fuselage anti-glare area helps to reduce the slick surface finish and gives the enamel a better grip.)

The Typhoon's control installation was straightforward. However, the rudder pushrod in my kit seemed too thin and flexible to be safe—especially since it was supposed to be completely unsupported between the servo and rudder horn. Instead, I used a 1/16-inch music-wire pushrod with a Z-bend at the control-horn end. I ran this through polypropylene tubing and anchored it to the servo platform in the same way as I installed the elevator cable. I used a Goldberg* pushrod connector on the rudder servo wheel, so that both servos have easily adjustable pushrod settings.

I didn't like the recommended method of installing the radio system. For the airplane to balance properly, the

(Continued on page 105)

NEW MONTHLY HELICOPTER SECTION

62 A Mini Review: Kavan Shark 40
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70 Helicopter Challenge
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75 Flying Inverted
78 A New Approach

WE'VE BEEN TALKING about it for some time, and we now feel that the interest and level of support necessary to sustain its growth is certainly there. No longer will you have to hope there are heli articles for you to read; no longer will you have to wait for material from foreign shores to reach you as intermittently as it might.

As I've said before we embarked on this adventure, we're serious about bringing you as much heli information as WE can, and we're prepared to allow this section of the magazine to become as large as IT can; but the key ingredient in all of this is encouraging you to provide as much input as YOU can. This can be in the form of letters, information requests, articles, event coverage, techniques—literally anything that might be of value to other heli enthusiasts.

One of the regular features will be formatted like our "Hints and Kinks" material presented by ace aero illustrator, Jim Newman. So if you've discovered any neat little tips that make building or flying helis easier, send a description or a sketch, and if we use it, we'll send you a free MAN subscription for your trouble.

We have a lot of other great things in the works: product reviews of many of the currently available or soon-to-be-released helis, along with Mini-Vals of the newest or most time-proven accessories. Since we expect many newcomers to join the ranks of heli fliers, we plan to present a broad range of how-to material that should be helpful to everyone.

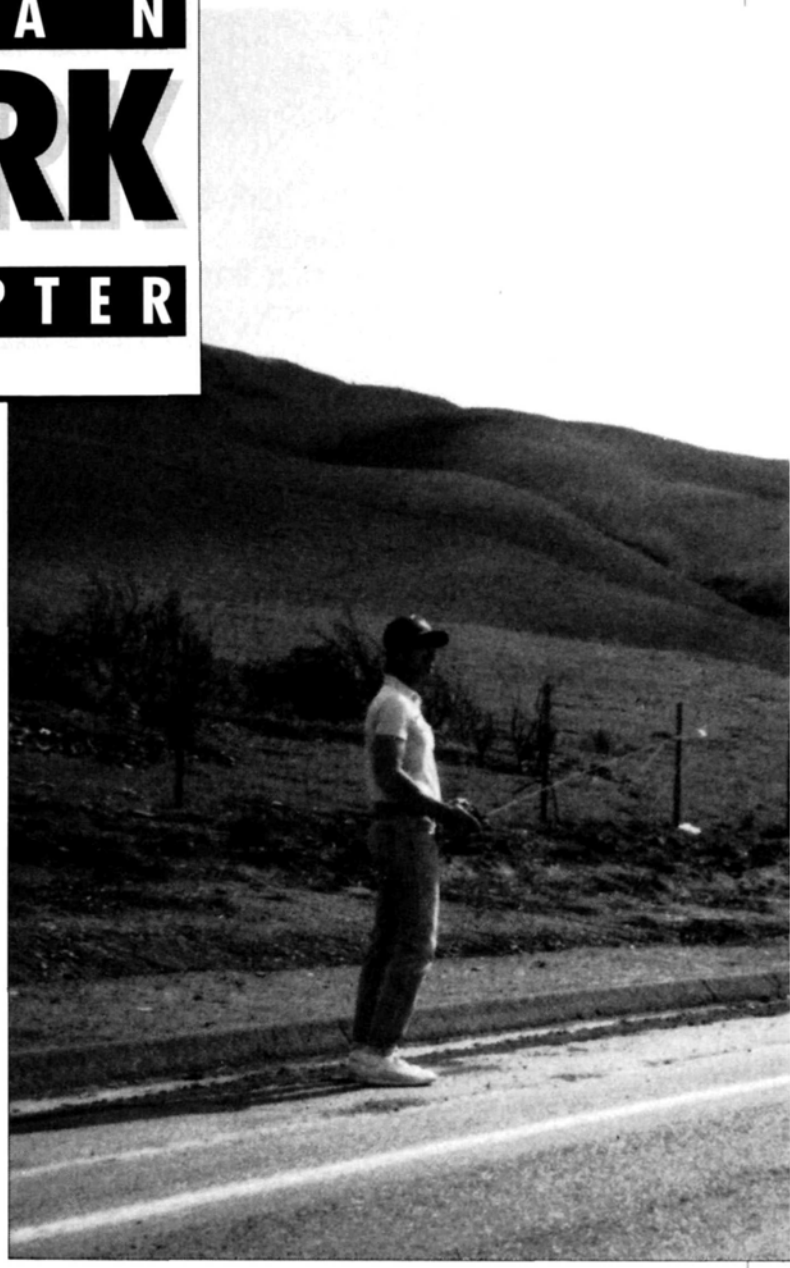
This is your section; it can be as useful and informative as you want it to be. The often-heard lament of "There isn't enough heli information available or accessible" should now become an excuse of the past. Make it happen! Participate! It's up to you.

Rich

MINI-REVIEW

KAVAN SHARK HELI 40 PTER

by DAVE HERBERT



IF YOU DON'T know a lot about helicopters, the Kavan* Shark-40 isn't for you. That's the bottom line. However, if you manage to get through some of the "rough spots," you'll be really happy with this fine machine, and if my review helps you to succeed with this kit, then I've succeeded, too. A manufacturer can't cover it all, so I hope you'll find this account of my experience useful.

Advertised Features

- Price - $399
- Fully aerobatic with collective pitch
- BLSC (Ball Linear Slide Control)
- Autorotation clutch

Equipment Used

- Radio-Futaba AM FP-T6FG/K
- Gyro from Century Systems of Australia
- Engine-HP .40 Gold Cup from Austria

Features I Liked

- Collective pitch
- Amazingly precise mechanical parts
- Mechanics can easily be removed from the fuselage with just a slotted screwdriver.
- Snap-on canopy is great!
- Pleasing appearance
- Fully visible fuel supply can be seen from afar.
- Extremely smooth mechanical running gear produces very smooth flights.

Features I Didn't Like

- The instruction manual should be stapled together (Hey, I hate paperwork—especially if it gets loose!)
- Several important steps either weren't mentioned, or weren't discussed in sufficient detail for me. (I'm assuming the position of ignorant beginner, because this is my first aerobatic helicopter. My other helicopters fly more

A reader's report on a low-cost, .40 powered aerobatic heli

PHOTOS BY DAVE HERBERT

Equipment access is simplified by the removal of the molded canopy. Also makes CG easy to achieve, and this, as text tells you, is important when flying time comes!

conventionally than this Kavan Shark-40, which is capable of air-to-air combat-type maneuvers.)

• Fuel lines are totally enclosed. My idle on the initial run-up was too high, and I had to hold the rotor blades so firmly with my left hand that the main drive gear let go of eight teeth before I was able to jam the starter up into the engine fan to force the engine to stop. This little episode also broke all of the fan blades off the cooling fan. I cured this by making two holes in the right fuselage side and routing the fuel line to the carb outside through a fuel filter then back into the engine. Now I have easy access to the fuel filter and can pinch or pull off a line in an emergency. The fan puller in the kit was useless for removing the fan; I had to use a small wheel-puller.

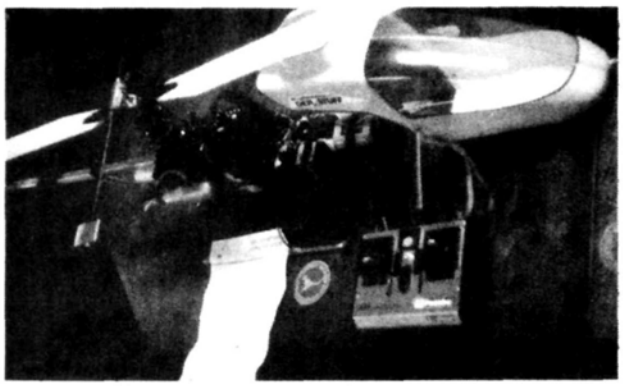
• The wooden parts aren't die-cut, and if you don't have a small jigsaw, you probably won't be able to cut the complex slots, etc. It took me 3 hours to cut out and assemble the plywood parts of the box fuselage. As indicated in the manual, this assembly must be well-painted with a fuelproof finish. This is important, because during my Shark's

KAVAN SHARK 40

35-plus flights, quite a lot of fuel has sprayed inside the engine compartment. Since it's relatively inaccessible, cleaning is a problem. Do everything right in the first place, and your glued joints won't come apart in flight. For fuelproofing, I used Krylon automotive engine paint, which has held up well without deteriorating.

• The glow plug can't be changed without a socket and extension, so carry one with you. The supplied glow-plug connector shorted out on the side of the plug after the first flight and had to be changed. This required disassembly and the use of a soldering gun.

OK, I admit it! I was wrong about the use of a gyro. Having had my share of hard knocks in learning how to fly helicopters (including breaking my foot in two places with a Mantis several years ago), I'm pretty comfortable flying my Kobe-Kiko-Hughes 300 with a gas engine. It's enormously heavy and very stable at 32 pounds. In contrast, my Super Mini electric helo weighs only 500 grams. Neither is very aerobatic.



The Shark 40 during assembly. Although it isn't overly complicated to build, the instructions aren't ideally suited to beginners and might require a bit

Flying Kavan's new Shark-40 after flying the Kobe-Hughes 300 is like driving a Porsche after driving a '55 Buick. This is a hot-rod if I ever saw one, and it's so pretty to look at, it will knock your socks off. But just like the Porsche, this chopper needs periodic maintenance, but compared to my heavy helicopter, it's so maneuverable that I was actually forced to buy my first gyro!

I have to tell you that since the inception of dual rates, roll buttons, snap buttons, etc., and all the controversy that went with these "cheat switches" in the '70s, I'd been thinking that I'd learned without a gyro and didn't need one. "It's a crutch!," I thought. I was wrong! What a joy it is to not have to concentrate on that tail rotor!

The Century Systems Gyro is fully adjustable from the transmitter and very easy to set up. With these lightweight helicopters, the gyro has proved its usefulness to me in those occasional gusts of wind that can spin the tail 180 degrees before you know it! (Some expert helicopter pilots admitted to me that they've been

caught in wind shear, too!) It just won't happen with a gyro. OK, let's talk briefly about the Kavan.

Generally, the instructions are very thorough and well-written, but as I built the Shark, I made notes on the pages where I was confused:

On page 6, the bulkhead-mounted fuel-tank installation is explained. The large brass ring that's included with the tank hardware is to be placed around the neck of the tank. Put this on *before* you mount everything (as I did) and have to remove it all to put on this neck brace. There's no mention of it in the plans or instructions.

On all pages, I'd like to have seen a drawing of a ruler with a millimeter scale. Trying to find out exact screw sizes is a *pain* throughout the entire building process. I constantly had to hunt for my little metal ruler, which was always under something, or my right hand was holding something as I was looking for the ruler. A ruler on each page would be a real treat.

On page 17, the assembly of the Ball Linear Slide Control (BLSC) is described. If you don't want to get too frustrated, call someone to lend you a helping hand. This BLSC is similar to a sliding tray used for mixing elevons (mechanically like those on flying wings using elevons). In the Shark-40, the BLSC houses three servos: roll, pitch and collective pitch. As shown, this sliding-tray assembly must be assembled by placing the tiny balls into each groove and screwing everything down so that it's smooth, and this takes *three* hands.

When this has been done, you'll have an amazing sort of ball-bearing sliding tray. I'd prefer it if the plywood fuselage parts and this sliding tray setup were preformed, prefab parts. Since all the other parts are amazingly precise, it seems that these parts should be pre-built or die-cut by the manufacturer. Be that as it may, make sure that you do this right, and you'll have one of the smoothest control systems available on any helicopter.

The center of gravity and its importance isn't really detailed in the instructions. I concentrated mostly on balancing the blades and not the fuselage. My Kobe Hughes with its gas engine is nose-heavy, so I'd never think of adding weight to the nose, and I didn't bother with it on the Shark-40. That was a *mistake*.

On its maiden flight, I made a shallow left-hand pattern around the field. When I began to fly back toward myself, I pulled

(Continued on page 111)

How To Track Main Rotor Blades

by CRAIG HATH

A BASIC BUT ESSENTIAL TASK SIMPLIFIED

VIBRATION IS ONE of the model helicopter's biggest enemies; it can fatigue metal parts and damage radio components. Three types of vibration affect our models: low frequency, medium frequency and high frequency. Most main-rotor-related vibrations are of the low-frequency type, with the pulse generated once per revolution of the rotor disc. If the tip-plane paths for each rotor blade aren't exactly the same, vibration will result. We call the process of bringing the planes of the main rotor tip together "tracking." In other words, we track the tips of each rotor blade as they rotate around the path of the rotor disc, and then mechanically adjust them until they all rotate around in the same plane.

It's also important to be sure that the rotor blades are in track throughout the range of pitch travel and power settings. The problem is that we might not always be able to get our machines into an attitude where the rotor disc is visible during all phases of flight. Knowing this, we must take a few steps to be sure that all the linkages and controls are adjusted correctly to ensure that if the rotor blades are on track during hover, they'll also track for most other parts of flight.

Usually, there are two linkage rods connecting the swashplate to the Bell-Hiller mixer and two linkage rods connecting the Bell-Hiller mixer to the rotor head, or there might be some combination of arms or levers and links. When there are pairs of rods, the rods in each pair must be exactly the same length. If the rods don't match each other, there can be a difference in control throw to the rotor blades causing the blades to go out of track. It's possible to get the rotor blades to track in one position (like a hover) and then go out of track in forward flight, e.g., if the control setup isn't correct. Make all your blade-tracking adjustments with the adjustable link that's closest to the

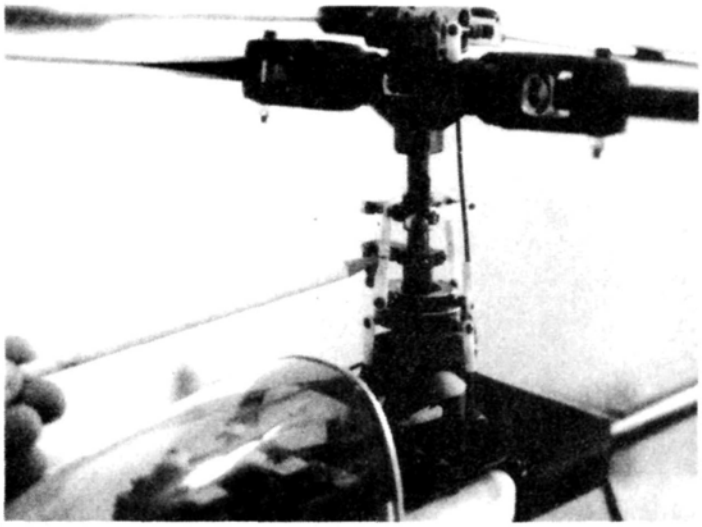
Above left: Don Wietz is running up his machine to the point just before liftoff. You can sight along the side of the rotor disc and check for blade track now. Above: When you can only see what appears to be one rotor blade spinning, the rotor disc is in perfect track, as shown here.

rotor blade—usually the link that attaches to the rotor-blade grip. By using this method, you'll keep the linkage geometry correct through all the collective-pitch throw range.

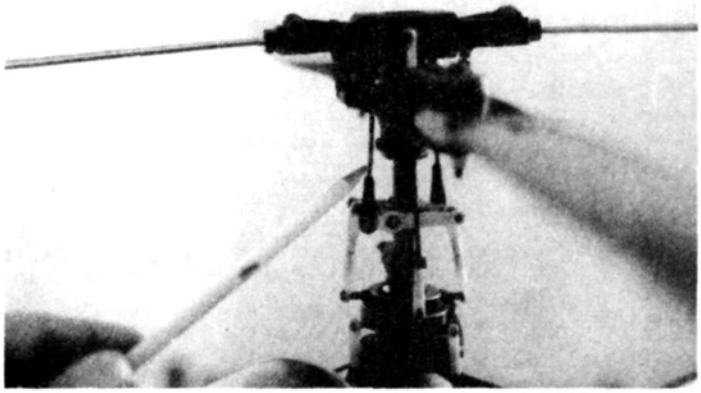
To ensure that all the linked pairs match up, some modelers use an inside caliper to measure the rod lengths from the inside of each end of the universal ball connectors. After doing this, they find that rotor-blade track is usually very close, right off the bench. The only other variables would be a slight deviation in the rotor head from one blade grip to the other, or a warp in a rotor blade, etc.

Checking rotor-blade track on the helicopter is easier if you mark a blade tip with a highly contrasting color to make it visible while it's spinning. However, using my usual method of blade balancing, the rotor blades are rarely far enough apart to allow for the application of a colored piece of trim tape to only *one* of the blade tips. There are two ways to approach this situation: You can apply two different-color pieces of tape (one to each blade tip so that the blades still balance), or you can mark only one blade so that it can be identified during the adjustment procedure. I usually do the latter, as this is the lazy way to go! The only problem with this method is that, when you make the first adjustment, you have to be lucky to adjust the chosen rotor blade in the correct direction.

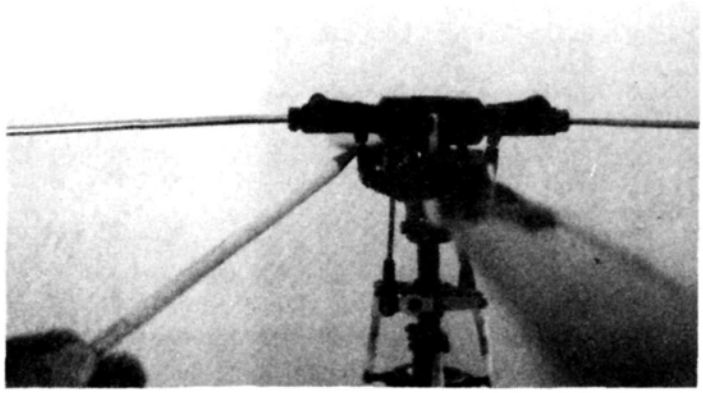
You can check static blade tracking on the workbench by placing your transmitter under the arc of the rotor disc and extending the antenna until it just touches the bottom of one rotor blade at its tip. Next, rotate the rotor blades around until the second blade moves to the antenna tip. If the tip touches the antenna in the same spot as the first blade, the static tracking is correct. If not, adjust the second blade until it matches the first. (For three or more rotor-blade systems, continue this process



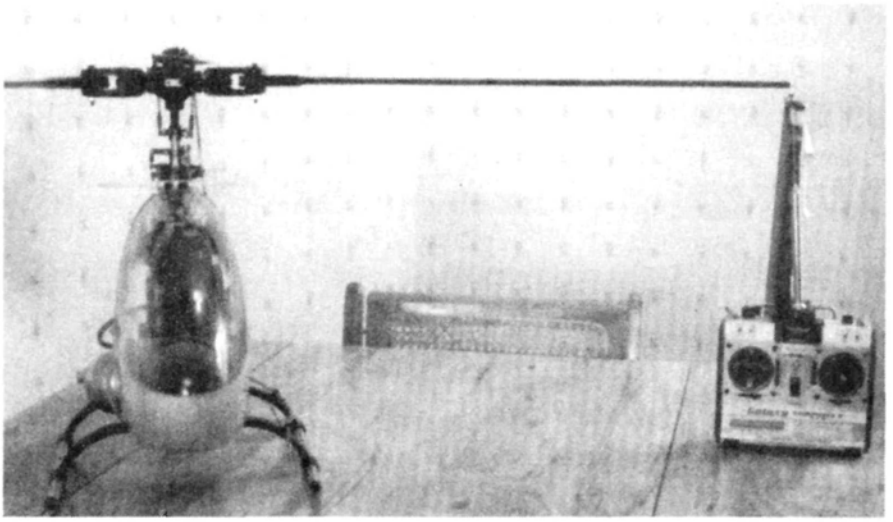
To maintain track through the full pitch range, this linkage must be adjusted so that it's the exact length of its opposing linkage.



Another common linkage that comes in pairs. Be sure that you don't attempt to adjust blade track with these rods. Always use the rod closest to the rotor blades.



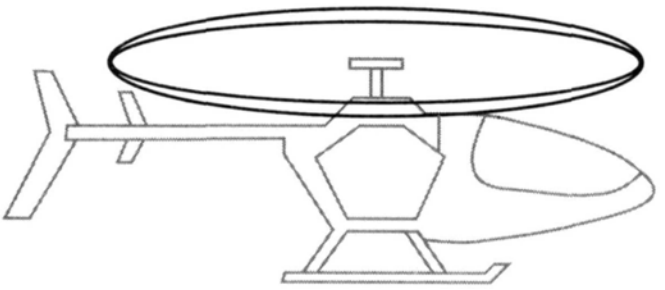
The links on the rotor head are where the blade-tracking adjustments should be made. Experience will teach you how much to turn the links in relation to how much the blade will change.



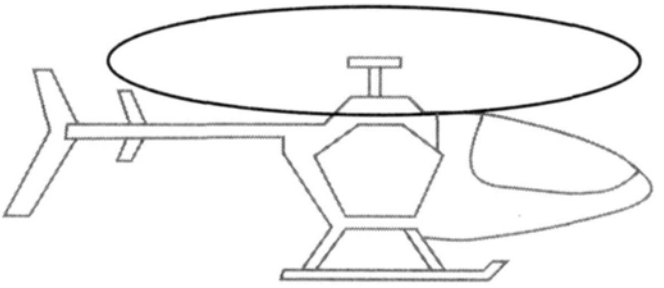
Static tracking can be set by using your transmitter antenna to measure the distance from the ground up to the underside of the rotor blade. Check all rotor blades and adjust until they match one another.

until the blades are the same.) Static tracking can give you a good indication of how the tracking will be during flight, but the loads of normal flight will often change it.

Checking tracking during run-up is the final step. Safety must be your primary concern here, so *always keep a safe distance away* from your machine. Don't stick your head into the spinning rotor disc just to check blade track! Start your machine, and open the collective pitch/throttle as much as possible without lifting the helicopter into a hover. Bend over and sight along to the end of the spinning rotor disc. If the blades are tracking, they'll look like one blade, but if they're out of track, you'll see two distinct rotor blades.



Rotor disc shows blades out of track.



The spinning rotor disc should appear to be only one blade thick, like this.

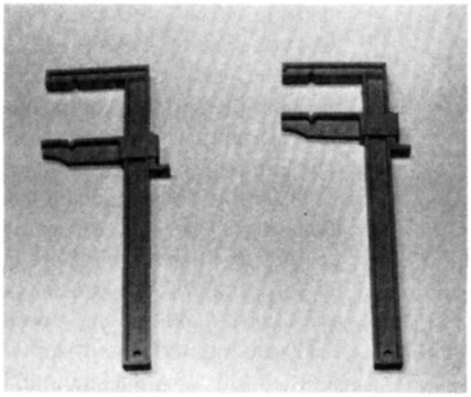
To adjust an out-of-track rotor disc, reduce the power and stop the disc. If you noticed that the rotor speed was high, adjust the lower blade so that it comes up to the higher blade; if the rotor speed seemed low, bring the higher blade down to the low blade. This will change the amount of pitch used at hover. Repeat the run-up procedure until the blades match each other perfectly. As you gain experience tracking rotor blades, you'll find that you'll know how much to adjust the linkages to get the blades in track, so that one try will usually get you close, and the second try usually produces perfect results.

You should check the blade tracking before every flying session to be sure that it hasn't changed. If you remove your rotor blades for transportation, mark one blade and one blade grip of the rotor head so that blades can always be installed on the same blade grips. If you take these steps, you'll find that the tracking will be "in tune" most of the time and many of the problems caused by vibration will be avoided. ■

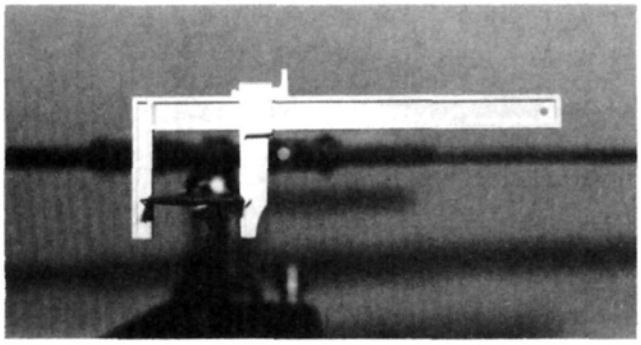
X-ACTO PLASTIC CLAMPS:

THEY'RE NOT JUST FOR AIRPLANES!

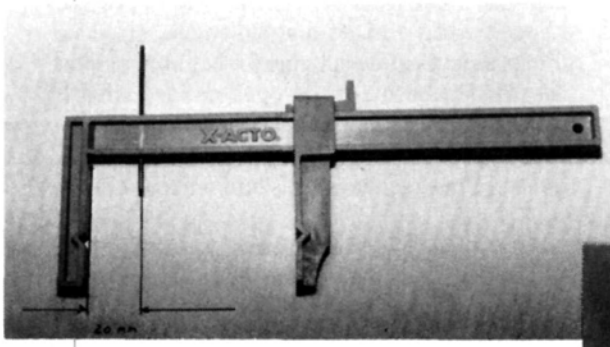
by MICHAEL FORTUNE



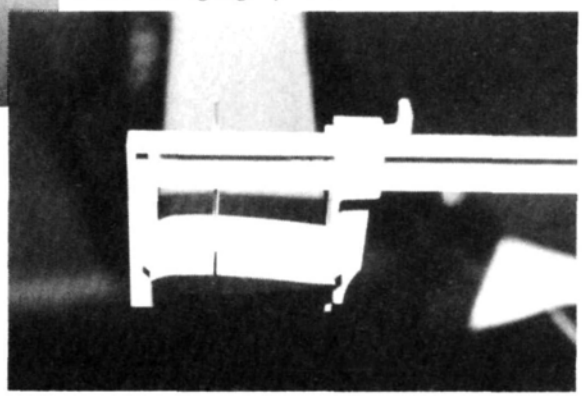
1. X-Acto Plastic Clamps (Part No. 7004) have an untold number of uses in fixed-wing shops all around the world, and they're finding their way into helicopter shops as well.



2. Aside from checking the squareness of wooden servo trays (e.g., for X-Cell and Schluter helicopters), these clamps can also be used as-is while assembling your helicopter, or they can be modified to suit other needs. In this photo, there's one clamp on each flybar paddle to check if the paddles are parallel. Sight along the top edge of the clamp and adjust the paddles as needed.



3. This photo shows how to modify a clamp to act as a gauge so that the blades can be marked for flutter testing prior to high-point balancing. The 20mm mark is for 66mm-width blades. (Symmetrical blades pivot at 33 percent of the blade chord, measured from the leading edge. Semi-symmetrical blades pivot at 25 percent.) The reason the pin isn't 22mm from the clamp jaw is because the vee notch measures 2mm in depth. The distance from the pin to the leading edge of the notch is 22mm.

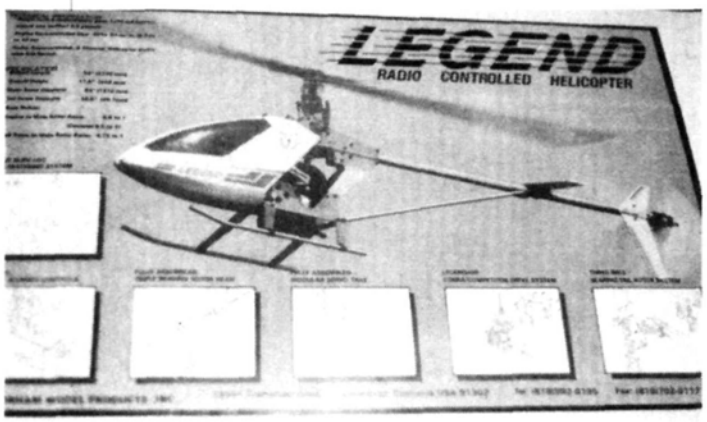


4. Here's a modified clamp being used to check the 22mm mark on the blade for flutter testing. Why not just measure and mark the blade each time? If you're not careful when you're building up your blades and sanding them, you might round off the tip of the blade. If you measure from there, your mark will be too far aft. If you want to re-check blade balance, and the blade tip has become rounded (e.g., by being bumped during transportation), you won't be able to get an accurate measurement!

Helicopter Challenge

Another item on Craig's workbench is this Honey Bee electric R/C helicopter. It's powered by a single 280-type motor and features full 4-channel operation. Not yet available in the U.S.

The new JR PCM 10 Heli radio, one of the new breed of computer-based systems that allow user-modified pitch and throttle curves to handle any kind of maneuver. Subject of some future special articles.



The author is working on the GMP Legend and will give details about it next month.

by CRAIG HATH

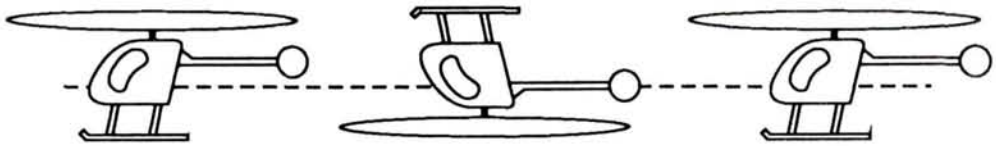
THE FLYING SEASON is finally upon us, and it's time to get those flying fingers back into shape. As you begin to practice, be patient with yourself, as we all have different learning curves. Just focus your efforts on the task you want to accomplish, and if you become frustrated with a particular phase of flight, go back to practicing one of the maneuvers that you do well. This will help to reinforce the fact that you *are* making progress—especially if you successfully do a maneuver that was initially difficult for you. As you regain your confidence, go back to where you left off and try again. Just be sure that you only push yourself gradually, and try not to overreach your abilities.

By taking the small-step approach to this sport, you'll enjoy it a lot more. You won't spend most of your time repairing a helicopter that you've crashed repeatedly because you attempted to do something for which you weren't ready. This isn't to say that you should progress so slowly that you agonize over *every* detail of flying; you must make headway at your own pace and continue to challenge your skills.

On my workbench right now there's a new Legend from Gorham Model Products*. I recently received a phone call from John Gorham, president of GMP. John was upset because I said that a flybarless helicopter was unsuitable for a beginner, and he asked if I'd overlooked the Legend when I made that statement, since he thinks that it's quite suitable for beginners. John has challenged me to be open-minded, so I'll soon give you a report on the Legend's performance. So far, I've been very impressed with the kit, and I'm eager to get this bird out to the field.

Reliable Rolls

This month, I'll continue the series about flying. As promised, we'll take a look at another basic of aerobatics: the roll. Compared with rolling a fixed-wing airplane, rolling a model helicopter is a complex maneuver. Yet the roll can soon be within the grasp of a flier if it's approached in the right way. To examine the roll, let's first take a look at the maneuver itself, then move to some set-up tips that make the roll easier, and finish with a detailed description of the control inputs



Ideally, while performing the roll, the attitude of the heli remains fairly level. Try to keep the nose level all the way through. Minimizing fore/aft cyclic during the maneuver helps.

as the roll is performed.

Place yourself in the pilot's seat of an imaginary helicopter. You're flying in straight-and-level forward flight at nearly full speed. You grab your joystick and push it to the right; the nose of the helicopter rolls to the right, and the horizon appears to move to the left. As the helicopter continues to roll, you begin to ease out of collective pitch, and you back off the throttle in anticipation of the helicopter's rolling upside-down. You watch the ground, which is now *above* you.

By now, you've reversed the collective pitch and have reopened the throttle to keep the rotor speed up to normal and give the helicopter lift while it's on its back. Still holding in the right cyclic pitch, the nose rolls back to the opposite knife-edge position, and you start to reduce the negative collective pitch while carefully reducing the throttle to prevent the rotor speed from increasing excessively. Now the helicopter comes back to the upright position, and, at the same time, you relax the pressure on the right cyclic while reopening the throttle and increasing the collective pitch. The maneuver is complete, and the helicopter is again flying in straight, forward flight. Whew! Of course, you're still sitting in your easy chair, but you feel a little disoriented. I don't know if anyone has ever rolled a full-size helicopter, but I do know that a model will perform the roll quite nicely—especially if it's properly set up to execute rolls.

(Continued on page 122)

ROTARY-WING ROUNDUP

NEW HELI PRODUCTS

FUTABA 7-CHANNEL HELICOPTER SYSTEM

There's Futaba Seven Series for helicopters, but you won't see the usual difference in the transmitter cases. Because of the many functions of the computer system, it was unnecessary to reposition any of the controls. The 7UHF system includes five S5101 servos and a high-powered 1000mAh Ni-Cd pack. Among the special R/C helicopter features are an invert switch, hover memory, pitch mixing, idle up and tail-rotor mixing. In addition to programming functions, the big LCD screen also provides information for servo reversing, PCM/PPM switching, transmitter-battery voltage and elapsed time of operation. At the touch of a button, everything you need to know for a perfect flight is there in easy-to-read numbers, and it even has a low-battery warning signal. The 7UHF system has a narrow-band receiver that meets the 1991 standards: the R128DF 8-Channel FM dual-conversion model. The R128DF is assembled using the latest SMT construction for super reliability, efficiency and compactness. Encasing the electronics of the 7UHF is an all-new transmitter case, ergonomically designed for comfort and optimal control access. The contoured back gives you a more stable grip. Mix rate and auxiliary channel controls are slanted for easier reach, and the open-gimbal control sticks are adjustable for length.

For more information, contact Futaba Industries, Inc., 4 Studebaker Dr., Irvine, CA 92718.

MINIATURE AIRCRAFT SKYTACH

To meet the needs of the discriminating helicopter enthusiast, Miniature Aircraft offers the Skytach helicopter tachometer. This tach is capable of monitoring rotor speed at any altitude, during maneuvers, and at any distance as long as the model is visible to the eye. Simply point the tach at the model and receive an accurate reading of rotor speed.

For more information, contact Miniature Aircraft USA, 2324 N. Orange Blossom Trail, Orlando, FL 32804.

ROBBE MAGIC

The Magic is a .60-size high-performance, aerobatic machine designed with the most recent FAI helicopter maneuvers in mind. The starting shaft, which doesn't rotate when the engine is running, is one of the many new design features: It's engaged only while the starting procedure is in progress. This prevents vibration, absorbs no power, and eliminates common alignment problems. Other features include a new pitch mechanism for the tail rotor, a new tail-rotor gearbox, a two-stage power transmission and an injection-molded servo structure. The rotor head and control system are those of the Scout 60, System 88. To top it all off, the major aluminum components are red anodized.

For more information, contact Robbe Model Sport, 180 Township Line Road, Belle Mead, NJ 08502.

KYOSHO SCALE FUSELAGES

The introduction of the Concept 30 meant that all fliers could enjoy successful helicopter piloting. Now, with Kyosho's new Concept 30 Scale Fuselages, fliers can enjoy realistic scale looks as well. These fuselages are molded for sturdiness and light weight, and come in three parts for easy attachment and removal. Three styles are available, each including a full decal set: Jet Ranger, Hughes 500 and Hughes 300. All but the Hughes 300 require a starter extension shaft. In addition to adding scale realism to the Concept 30, these fuselages offer other benefits to fliers—the Hughes 300, for example, provides a highly visible focal point for new pilots while they learn control techniques.

For more information, contact Great Planes Model Distributor, P.O. Box 4021, Champaign, IL 61820.

AMBROSIA R/C AEROCHOPPER

The R/C AeroChopper is an R/C aircraft simulation system. R/C AeroChopper is currently available only for Atari ST computers. The R/C AeroChopper system includes a Futaba Conquest dual joystick box, a program/interface cartridge and a detailed owner's manual.

R/C AeroChopper features R/C aircraft flight simulation with a very realistic control response. High frame rates offer smooth aircraft motion. The frame rates vary with aircraft image size and complexity, background objects and features in use. The frame rates are usually between 15 and 20 frames per second, and can be as high as 30 frames per second.

R/C AeroChopper uses the same joy-sticks and case used for Futaba Conquest R/C transmitters, and this further enhances the realism of the simulation.

The user can choose from seven aircraft images and 22 aircraft parameter sets (flying characteristics). The aircraft and flying conditions can be customized by changing any of the 131 easily modified menu parameters.

For more information, contact Ambrosia Microcomputer Products, Inc., 98 W. 63rd St., Suite 371-R, Willowbrook, IL 60514.

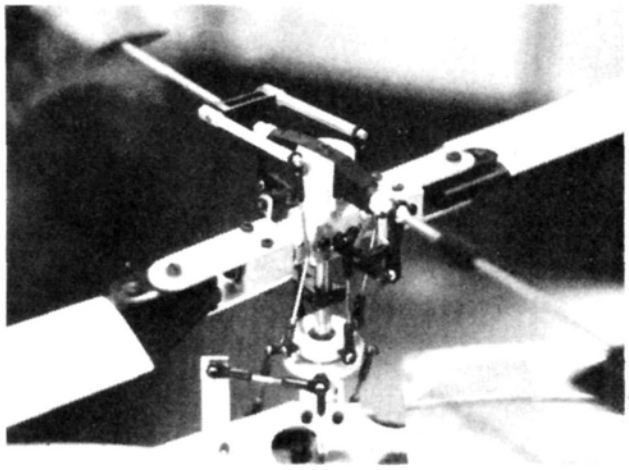
HOBBY DYNAMICS EXCALIBUR

The Excalibur is designed for the U.S. style of flying and makes a perfect FAI-type competition helicopter. The design of the Excalibur's cooling fan, cooling shroud, and clutch is borrowed from the Omega Professor. Other features include an aluminum tail-rotor gearbox, a self-aligning cooling fan and start-shaft system, a metal tail boom with multiple drive-shaft supports, a 2.2mm drive shaft, and a sturdy, plastic radio tray. The kit features an aerodynamically designed,

white ABS plastic body, a tinted windshield, an autorotation system, K-series weighted rotor blades ready for finishing, a new shaft-start system, and all required control linkages and hardware.

For more information, contact Hobby Dynamics, 4105 Fieldstone, Champaign, IL 61821.

ROTARY-WING ROUNDUP



HOBBY LOBBY COLLECTIVE PITCH CONVERSION

This kit is easily installed on Sport 500 non-collective-pitch helis (HLA400) to give collective-pitch control. Collective-pitch control is the increase or decrease of the blade angle of both rotor blades simultaneously to perform ascents or descents. On a model helicopter, two servos are used together to change the main rotor blade's pitch simultaneously with engine throttle changes. If you have a 4-channel radio, two throttle servos can be hooked up in parallel to give these control movements. The MFA Collective Pitch Conversion is made mostly of machined aluminum parts for long life and durability.

For more information, contact Hobby Lobby International, P.O. Box 285, Brentwood, TN 37027.

GMP THE REBEL

GMP introduces a very inexpensive 40-size helicopter that's specially designed for the beginner. The Rebel, a fixed-pitch helicopter with a minimal parts count, has inherent static stability, a well as moderate aerobatic capability. The Rebel's parts are of the quality you'd expect from GMP. The advantages of the 40-size machine are that it's big enough to be seen, it's less affected by wind than smaller models, and most important, beginners can use a very inexpensive 40- to 45-size engines. Because of the rotor blades' fixed pitch, the Rebel can also use a standard 4-channel airplane radio. The Rebel is the first R/C helicopter that's accompanied by a low-cost video tape that will take the beginner from building and set-up to trimming and flying.

For more information, contact Gorham Model Products, 23961 Craftsman Rd., Calabasas, CA 91302.

GLOBAL HOBBIES EZ REPLACEMENT BODIES

EZ chose the popular Bell 222UT for its first production run. This heli is sleek, aerodynamically clean, and has a high-speed look even when it's standing still. The shells will fit Hirobo, Kalt, and Kyosho .25- to .30-size frames. The fuselage and tail-boom shells are made from a new plastic that has been used successfully in the automotive industry. It's durable, lightweight, and can be painted. Each kit includes all the precision die-cut plywood parts necessary to make the body fit different chassis.

For more information, contact Global Hobbies, 18480 Bandilier Circle, Fountain Valley, CA 92728.

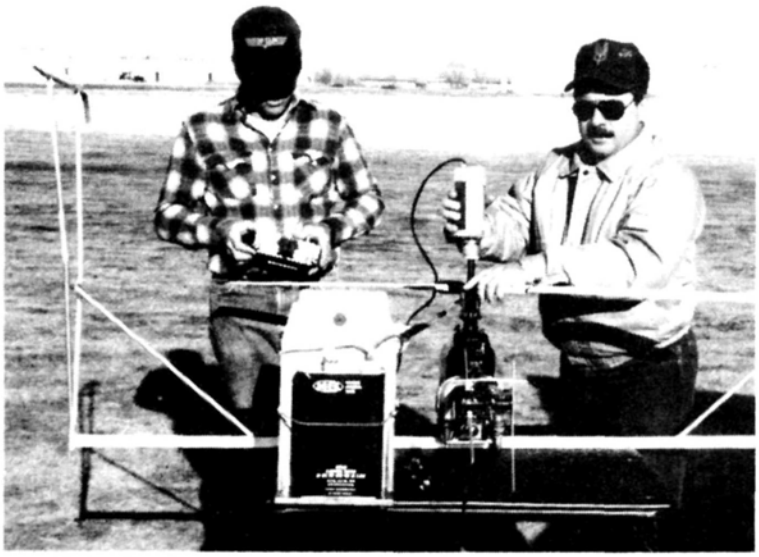
A last-minute check before the training begins. Note small dowel extending from rear of skid.

SO YOU WANNA FLY INVERTED !!

by PAUL TRADELIUS

A confidence-building approach to inverted-hover training; could save many repair parts dollars!

PART OF THE fun of almost any hobby is trying something new, and if your hobby happens to be R/C helicopters, that might include trying a loop, a roll, or an autorotation landing. And if you fly long enough, you'll eventually want to try your hand at inverted flying. I'm not sure why we get the urge to fly upside-down; maybe it's because a helicopter seems to have a hard enough time just trying to fly right-side-up. But whatever the reason, I'm sure you'll eventually want to see the skids pointing toward the sky.



Richard and Gary show the starting technique on Gary's X-Cell.

Actually, flying inverted is no harder than flying upright, but when contemplating the maneuver, there's always the fear of the unknown coupled with the possibility of having a huge repair job on your hands if you make a mistake. So the way most of us started inverted flying was by getting the helicopter well away from the ground—several mistakes high, with plenty of room to recover. After feeling comfortable with some rolls to

Richard demonstrates inverted nose-in hovering.

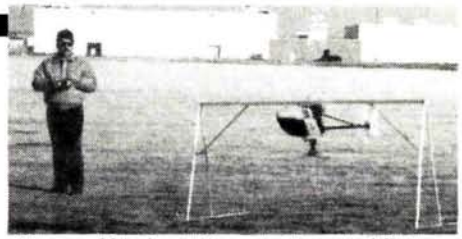
reaffirm the helicopter's ability to get into and out of the inverted position, the time came to "flip the switch." Although this might sound like a spur-of-the-moment decision to give it a try, that's anything *but* the truth. The helicopter must be specifically set up for inverted flying, with a lot of "hangar flying"—just practicing with the inverted switch to go into and out of the inverted mode.

Once the preparation is complete and you feel as ready as you'll ever be, there are still problems with the conventional way of trying inverted flying. One problem is that, for safety, you're very high, and this makes the helicopter hard to see, and therefore difficult to control. Also, because the helicopter is always moving, it's soon time to turn, or recover to the upright attitude.

With some of these problems in mind, Richard Morris of Ft. Worth, TX, decided the best solution would be to design and construct a helicopter stand for inverted hovering. His result can be seen in the accompanying photos. Made of light aluminum tubing, care has to be taken during the welding process, or you'll easily wind up with a lot of scrap aluminum. Luckily, Richard is an expert with this kind of manufacturing.

The original design was certainly wide enough, since the legs had to clear the rotor blades, but being about 2 feet long, the skids made it a little unstable in the fore-aft direction while landing. This was easily overcome by adding a small dowel to the rear of the skids to give it a better footing.

As can be seen from the photos, the helicopter is bolted firmly to the training stand, started, and carried away from the pits to face into the wind. With the inverted switch activated, just tell yourself that "skids-up is normal," and fly the helicopter as if it were right-side-up.



Gary and his first attempt at inverted flying. No problem!

The advantages of this type of training stand are that it enables you to start practicing from the normal hover position and close to the ground, which you're very used to.

I'm glad to report that, as far as I know, there have been no mishaps with this training stand, and it certainly has been of help to several people starting inverted flying. In the photos, Richard is demonstrating the flying stand to Gary Saia of Action Hobby West*. If you'd like further information on the stand, please contact either Richard or Gary at Action Hobby West.

You can contact Richard and Gary at: **Action Hobby West, 2037 Minnie, Arlington, TX 76012. (817) 261-9343.* ■

NEW APPROACH

SOME VIEWS ON THIS IMPORTANT PHASE OF

by DATU RAMEL

AS THE PILOTS AT the local field are practicing this spring, we see approaches from one corner of the model helicopter flight envelope (high or fast negative Gs) to the other (low or stationary or high Gs). We see approaches for experts (target autorotations), approaches for intermediates (abrupt transitions from forward flight back to hovering) and approaches for beginners (spot landings). Pilots at all levels of skill bring in their helicopters in a certain way, then they go up and around to try it a dozen more times attempting to make hitting the spot look easy. Ray Leon spends a whole tank trying to put his Baron 60 2 feet above the same patch of grass after each large-radius descending turn. Frank Krallk experiments with downwind approaches since he discovered (by accident) that downwind turns and landings are more challenging than the normal types. Bob Hoffman practices cautious vertical descents while trying to become better acquainted with his new friend, negative pitch.

What's going on here? This isn't the rough-and-tumble world of drop-dead hot-dogging that creates legends; surely, the people walking their dogs or driving by the field will consider our hobby somewhat boring. ("Those pilots are just doing approaches.")

I've talked with those pilots. They want to fly confidently enough to do circuits with a fuselage machine; they want to do simple aerobatics when they're comfortable with the idea; and they're a little uneasy about never having flown fixed-wing model aircraft. They don't have a lot of spare time, they don't plan to enter contests, and each flies for himself. Sound like anyone at your field? Such pilots have discovered the "practice makes" part of the adage, without necessarily having found the "perfect."

A pilot practicing approaches is like an amateur golfer on the putting green, putt after putt after putt. His performance isn't exactly awe-inspiring now, but someday he'll nail the 15-footer for a birdie after his bunker shot on the 18th hole. Back at the field, it's bringing the helicopter in from high out there to right down here (sometimes prettily and sometimes not), but the pilot will eventually put the bird right where he wants it. A great deal of air time is spent improving helicopter approaches, so I'd like to make a modest proposal: Let's promote "the approach" to a fully fledged accepted group of maneuvers, just like the loop or the roll.

In aviation, it's a maneuver if you can do it again the way you did it the first time and if a judge, instructor, or adversary can tell that you *tried* to do it again. The approach has been neglected as a maneuver worthy of study and practice because it looks and sounds simple. Spectators and novices don't get whiplash watching a

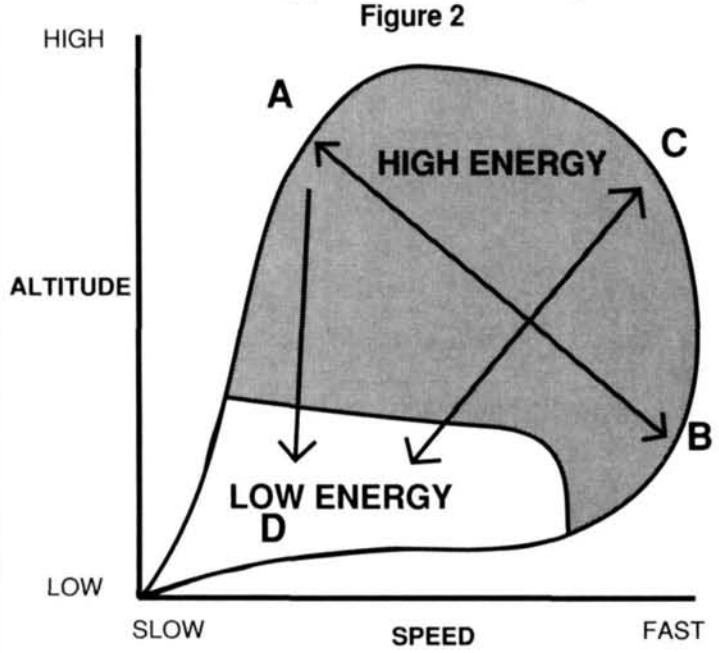
Fig. 1

Type of Approach	Change in			
	Altitude	Ground Speed	Air Speed	Distance
vertical descent	dec	same	same	dec
over-shoulder auto	dec	dec	dec	dec,inc
nose-in auto	dec	dec	dec	dec
entry to top hat	same	dec	dec	dec
steep descent to spot	dec	dec	dec	varies
fast forward flight to hover	same	dec	dec	varies
circling approach	dec	dec	varies	same

dec=decrease; inc=increase

Energy State Envelope

Figure 2



Aircraft maintains energy going from A to B or vice versa, trading altitude for speed or speed for altitude.

Aircraft reduces energy going from A to D or C to D, losing

model heli coming in for a landing, so they don't think approaches are as difficult as the high-G stunts upstairs. From our first experiences with losing translational lift, we all know that an approach can keep you very busy on the sticks—even busier than with some single-axis aerobatics. Let's analyze the approach from several vantage points (those of observer, machine and pilot), not only as a maneuver in itself, but also as a foundation for improving compound and aerobatic maneuvers.

An observer watching autos, spot landings, steep descents, or touch-and-gos will eventually recognize things that decrease during these tasks: altitude, ground speed, air speed and distance from the heli to the pilot. (Figure 1) A casual observer might conclude that an approach happens when the heli comes down, goes slower, comes closer, or stops. A highly trained observer who has read the FAA manual for flying full-size helicopters evaluates an approach by considering controlled rates of descent and deceleration, smoothness of trajectory and attitude, and precise placement on or over the pad.

If we borrow a page from the 1:1 air-combat textbooks, we can form an idea of what the helicopter goes through during an approach. Figure 1 shows a pattern of reducing altitude and/or reducing speed. The drivers at Miramar and Nellis talk about the interchangeability of altitude and speed in the energy-state framework of describing maneuvers: Lose height to go faster than a bogey, or lose speed to get above him. For our model helicopters, we can say that an approach is a controlled transition from a greater energy state—high, or fast, or both. (See Figure 2.)

The common-sense notion of an approach by any aircraft (what goes up ought to be able to come back and slow down) belies the difficulty of piloting the craft from a high-energy state to a low-energy state, and the difficulty of designing a craft that's able to do just that in the first place. Aeronautical engineers design full-size airplanes with approaches in mind.

The swing-wing technology of the Air Force F-111 and B-1B bombers allows these planes to fly well-behaved, full-load takeoffs and landings (wings extended in the high-aspect ratio that suits low air speed), as well as near-supersonic missions (wings swept back in the low-aspect ratio needed for high-speed cruising or attack). In-flight alteration of the sweep-back angle and aspect ratio in an airplane is also referred to as "variable geometry " (VG). (See Figure 3.)

The F-14 Navy fighter has, in addition to a VG design, a mission-adaptive wing. This means that the wing's shape, or airfoil section, can be adjusted to fit the required maneuver or speed (see Figure 4). In a dogfight, the wing's leading and trailing edges are set for -7 and 10 degrees, respectively, but for landing, they're set to -17 and 35 degrees. The extreme concave shape of the approach wing setting allows the Tomcat to fly slowly at a high angle of attack without stalling. The older, non-VG, non-adaptive-wing F-4 Phantom has to approach a carrier 20 knots faster than the F-14.

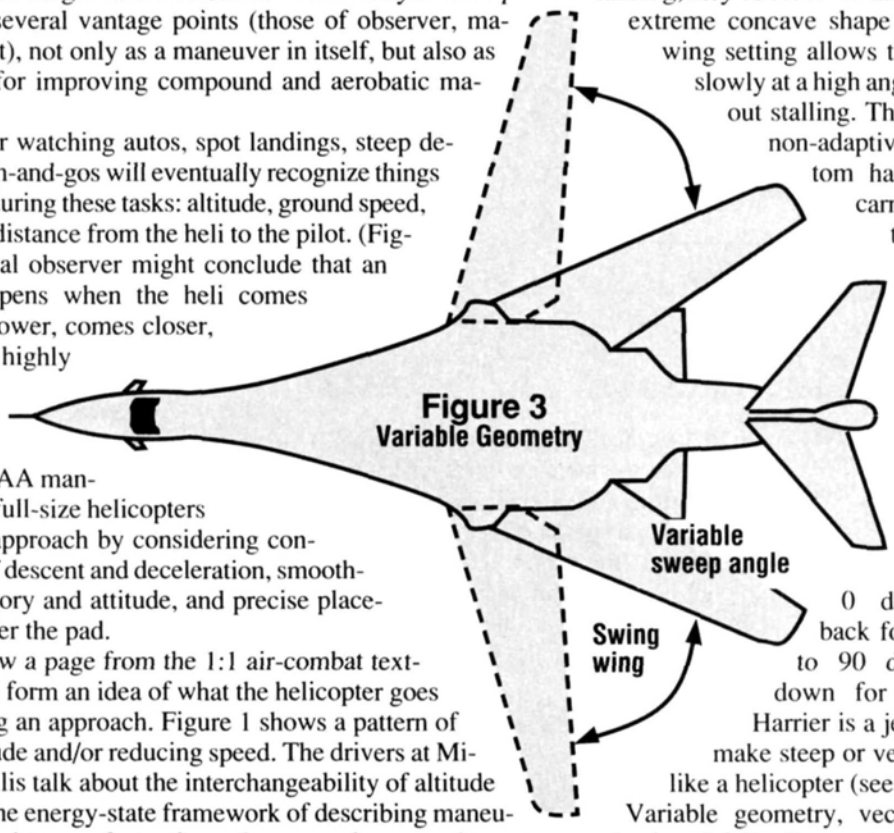


Figure 3
Variable Geometry

The Marine AV-8B Harrier is designed to operate from short airstrips or from no airstrip at all. Four rotating nozzles deflect the turbofan thrust, anywhere from 0 degrees (straight back for forward flight) to 90 degrees (straight down for hovering.) The Harrier is a jet fighter that can make steep or vertical approaches like a helicopter (see Figure 5).

Variable geometry, vectored thrust and adaptive airfoils all serve to make the energy-state range of an aircraft broader by improving the low-and-slow section of the flight envelope, or by making it easier for the pilot to get there. The F-14 driver knows his carrier landings would be almost impossible without the Tomcat's wings extended; the Harrier pilot can rotate his nozzles and dump a lot of energy "right now" in mid-turn, causing his opponent to overshoot; and all this in addition to the obvious benefits of short field and VTOL operations.

In the world of model airplanes, there aren't very many ducted fans with functional swing wings or rotatable nozzles, but our glider pilot brethren have devised very sophisticated ways of changing the lifting characteristics of their aircraft in flight. Sailplane columnist Byron Blakeslee has described how special transmitter mixing is used to implement an

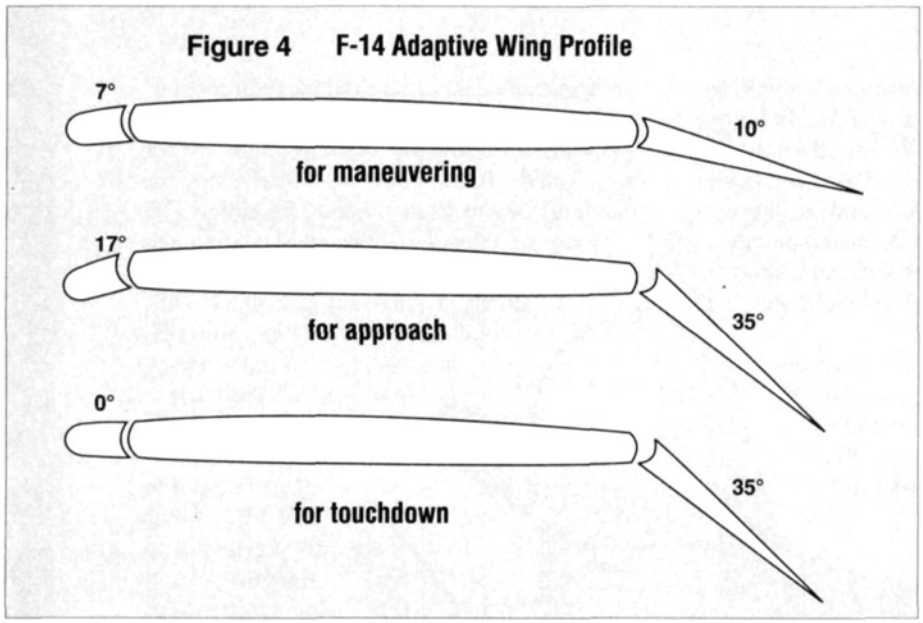


Figure 4 F-14 Adaptive Wing Profile

adaptive wing method so that a contest glider that cruises well can be transformed into a ship that can be landed slowly and accurately. Soaring pilots use spoilerons or crow setups on their radios. During an approach, the left joystick setting is reduced to lower the flaps, and when the stick passes a trigger point, the ailerons are raised on both wings to add their drag to that of the flaps. Lift is spoiled by both ailerons (a bit like a speed brake) to reduce speed and to increase the approach angle, hence the term "spoileron."

All these mechanical innovations are ingenious ways of improving low-speed approaches, but there's something about the way all these aeronautical gadgets are controlled that leads us back to what those rotary-wing guys are practicing at the local field. Figure 6 summarizes these low-speed gadgets and how they're put into action.

Take a look at the right-side "Do This" column. Pilots of any of these machines are doing some very important things with their left hands during an approach. A casual observer or beginner thinks of "low left stick" as "low, not high", "slow, not fast", or "land, not fly." It's much more involved than that because, at some crucial point before completing the approach, the pilot might need to do something that seems contrary to common sense before touching down or stopping in a hover: The F-14 jock needs slightly more power to overcome the increased drag of the concave airfoil, and the sailplane pilot needs to cancel the spoiler effect if he's gliding in short of the target. The Harrier and model helicopter pilots need to throttle-up at the end of an approach, because hovering calls for a lot more power than does forward flight, in the same way that treading water is more tiring than swimming a stroke.

Because you're asking your left hand to do something that goes against your instincts, approaches require study and practice. Someone new to forward flight who's struggling with the transition back to the hover will learn the hard, expensive way that "low left stick" is *not* a landing command all by itself, unless we take the time to explain to him that completing an approach changes the results of moving the left stick. We might say that the bird we're flying at the end of an approach isn't the one we were flying at the start. As intermediate-level pilots, we practice approaches and retrain our left hands to routinely perform "unnatural" movements, and we enter the domain of collective/cyclic independence. This means being able to divert half of your concentration away from the elevator and aileron controls during an aerobatic maneuver to do something constructive with

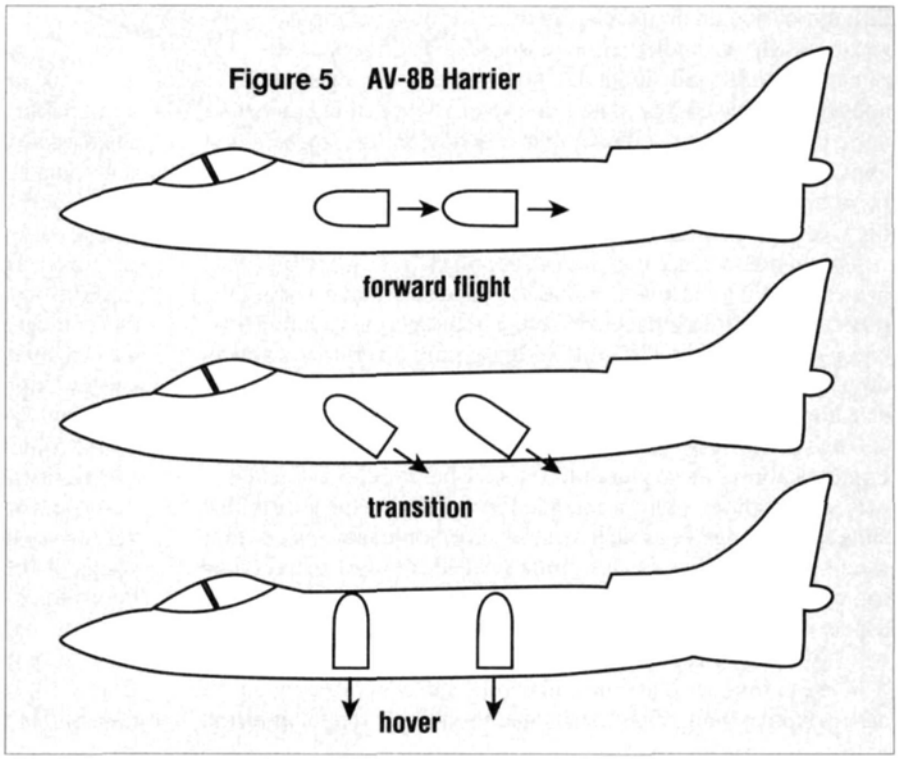


Figure 5 AV-8B Harrier

Fig. 6

Aircraft	Need for Approach	Do This
F-14 Tomcat	Extend wings and adapt airfoil	Reduce throttle with LH, computer senses proper air speed at which to actuate wing, slats and flaps
AV-8B Harrier	Rotate nozzles down	Use LH to pull back on the nozzle level located alongside the throttle lever; get ready to raise throttle to hovering thrust when translational lift is lost
F3B Sailplane	Spoilerons/crow	Lower LH joystick to increase effect of flaps and to trigger ailerons as spoilers
Model Heli	Reduce collective, bleed off air speed, transition to hover	Lower LH joystick to lose altitude, a bit of back cyclic to flare and decelerate, get ready to raise throttle/collective stick to a hovering setting once translational lift is lost

the throttle/collective stick. Remember those early loops? Build up a head of steam, yank with the right hand, count to three and breathe again? After surviving *that* a few times, you could spare a nanosecond or two at the top to reduce collective pitch a bit so the loop becomes more circular and so your ship won't suck itself out of the sky like old what's-his-name who hasn't been seen since his first 2.8 loops.

Practicing approaches leads to your being able to recognize which, and how much, collective you need at the moment, and how to give the appropriate left-stick command, regardless of what's happening on the swashplate side of the radio. Before long, you'll be able to enter loops and rolls while grinning with anticipation about when to grab that perfect -1 degree of pitch just before the skids-up part. By next season, grabbing negative collective instead of the switch will be second nature whenever you see the disc below the fuselage.

Auto/Helis

Many prospective R/C helicopter pilots have asked me to describe the differences between the various brands of helicopters. To explain our hobby to beginners, I often use sports car metaphors: "Hovering is like driving fast on ice"; "A model heli calls for maintenance like a race car"; and "Imagine driving an R/C car with your left hand while playing Pac-Man with your right hand"; so I've devised a juxtaposition of automobile nameplates and the objects of our affections, the R/C heli:

- A founding firm of the industry; represents high standards of engineering and manufacturing: Mercedes-Benz/Schluter.
- Slightly unconventional mechanicals; not as strong in the market as they used to be: Renault/Kavan.
- Helped expand the market; known for sporty types at a good price: Datsun-Nissan/Hirobo.
- Quality manufacturing and excellent reliability: Toyota/Kalt.
- Successful in other industries; new to the American market; emphasis on engineering: Acura-Honda/Kyosho.
- Sporty image; continental appeal; quirky handling: Porsche/Heim.
- Boutique image; limited production; small market: AMG-Maserati-Lotus/CD-Sitar-Wik-Orthofer-TSK.
- American know-how and marketing; top-gun image: Corvette/X-Cell.

Have fun with your autos! ■

SPIRIT OF 74

(Continued from page 37)

Move the battery pack and servos around until the plane balances at the point indicated on the plans, then install the radio to maintain this balance. Connect the elevator and rudder to the servos with pushrods made from soft 1/4-inch balsa, as shown. Make a Z-bend in the throttle wire to engage that servo. Check to see that everything responds properly to the transmitter controls and that there are no warps in any of the flying surfaces. Now, after a range check, the airplane is ready to fly.

PERFORMANCE: The Spirit seems to be happy with a 7-3.5 Cox gray prop, and most flying has been done from a hand-launch because it's so easy to do. However, on the test flight, it might be a good idea to work from the runway. Taxi around for a while to get the feel of things, then head into the wind and go! Hold it on the ground until a little extra speed builds up, then rotate to a gentle climb.

Once in the air, trim the plane for level flight at full throttle. In this configuration, low-speed trim will still be well within range of the trim lever on the transmitter. The control response is positive and solid and the performance will surprise you, for this .074 is a real horse! The combination of light wing loading and throttle offers an envelope that goes from an almost straight-up climb to a nice, easy throttled cruise.

Like all rudder airplanes, the rolls aren't as smooth as those of machines with ailerons, but, because of the power up front, the Spirit flies through them smoothly. Inverted flight is easy, even at reduced throttle, and outside loops are

(Continued on page 85)

SPIRIT OF 74

(Continued from page 82)

just as tight as inside loops. On a fairly smooth field, touch-and-gos are great fun. The tail wheel is effective, without being skittish, and it offers good directional control during taxiing. Just remember to steer with your right hand on the ground as well as in the air!

**Here are the addresses of the manufacturers mentioned in this article:*
***Cox Hobbies, Inc.,** 1525 East Warner Ave., Santa Ana, CA 92705.*
***Coverite,** 420 Babylon Rd., Horsham, PA 10944.*

■

HOW I SURVIVED

(Continued from page 30)

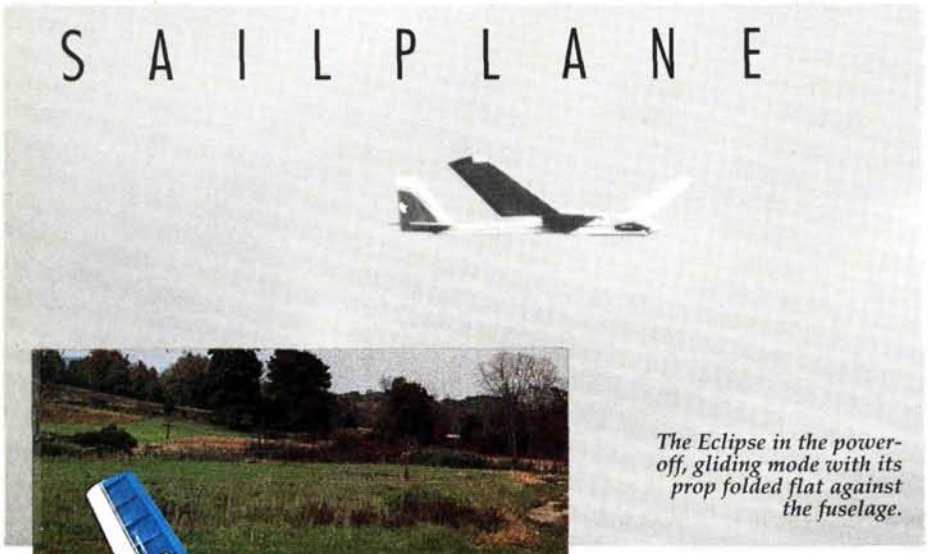
pect too much up-elevator), but I lost orientation (that's when right is left and left is right). It was the hardest thing for me to remember. As my instructor says, if you have to think about it, it's usually too late.

As I was wondering which way to move the stick, the Tooter was spiraling down. This is when your instructor ordinarily steps in and saves your craft. As the glue was drying on the vertical stabilizer, I recalled what should have been done. In

(Continued on page 89)

ECLIPSE SAILPLANE

A top-notch sailplane kit from a top-notch radio manufacturer



The Eclipse in the power-off, gliding mode with its prop folded flat against the fuselage.

by HANS HOCHRADEL

THE ECLIPSE is Airtronics'* 2-meter electric sailplane design, and it's a beauty. The design includes all the features a modeler could want: high-performance airfoil, three-piece wing, gear-reduced electric motor, folding propeller and a nicely prefabricated kit. Airtronics has really hit the nail on the head with this product!

Airtronics has manufactured quality kits for a long time. For those who have never built one, let me explain what constitutes a top-quality kit. First, you need a good-flying airplane with a series of prototypes that verify that the design and paperwork really deliver a good, solid-flying airplane, not a marginal one.

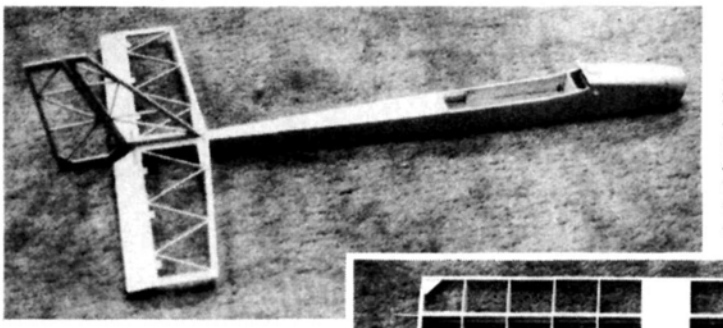
Next, the kit and instructions should be developed so that most modelers can build the thing successfully. All the stress points and hangar-rash areas should employ the right kind of materials and construction techniques to avoid problems and ensure longevity. In all these areas, Airtronics has done extremely well—particularly on the stress points. The kit comes with all kinds of spruce doublers to laminate to the balsa, and it has plywood in the areas that should be plywood. The best thing is that it's easy to build and flies great!

THE KIT: As you'd expect, the box, the instructions and the plans are

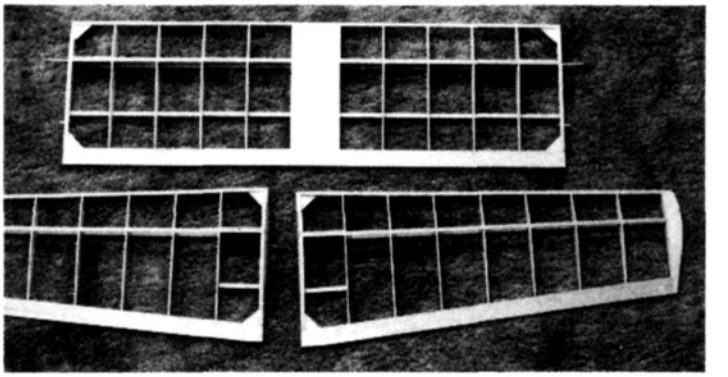
PHOTO BY HANS HOCHRADEL

SPECIFICATIONS

Type: *Electric Sailplane*
Span: *78 inches*
Weight: *45 ounces*
Wing Area: *660 square inches*
No. of Channels Req'd: *3*
Engine Size: *.05 Electric*
Sug. Retail Price: *$49.95; $79.95 Deluxe Kit (includes motor, prop and gearbox)*
Features: *All-balsa kit with exceptionally high-quality materials and instructions. Three-piece wing simplifies transportation.*
Comments: *An excellent kit that performs well as designed. Straightforward in construction, the novice should have no trouble successfully building the kit. Very docile and forgiving flight characteristics.*



Left: Basic fuselage with empennage attached, ready for covering. Light, simple, but sturdy structure.
Below: Three-piece wing makes transportation easier. Center section has aft spars for torsional rigidity.



of top quality. Since the instruction booklet is so good and includes lots of photographs, step-by-step instructions, etc., I'll cover the areas I liked, changed, or needed a little help with.

The deluxe version of the Eclipse comes with the electric motor, the reduction gearbox, the switch harness, the folding prop and the spinner. The kit goes together beautifully. Although the manual is incredibly complete in regard to building the airplane, it's a little vague in a few areas.

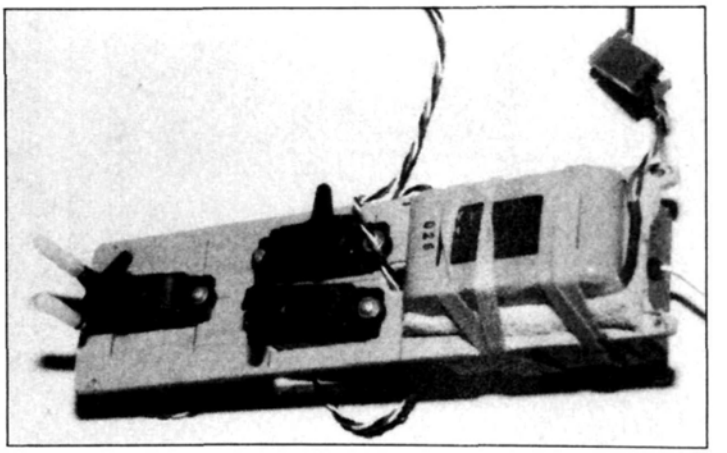
- Gearbox: The small brass gear is press-fit onto the motor shaft. Be careful! You only get one chance to get it right. Press the brass gear onto the shaft as hard as you can. Check the alignment, and if it looks good, put the back end of the motor (where the commutator shaft comes through the case) against the vise and lightly tap the brass gear onto the shaft with a small hammer.

The rest of the assembly can be figured out by looking at the pictures in the manual. The gearbox is made of plastic, and it's held together with self-tapping screws. After a few assemblies, the holes for the self-tapping screws stripped out, so I carefully drilled out the stripped holes with an 1/8-inch drill, then filed a little of the back of the gearbox away and assembled the gearbox using a 4-40 bolt and nut. After assembly, I put a little Hot Stuff* on the nut only, so that the gearbox can be reassembled over and over again.

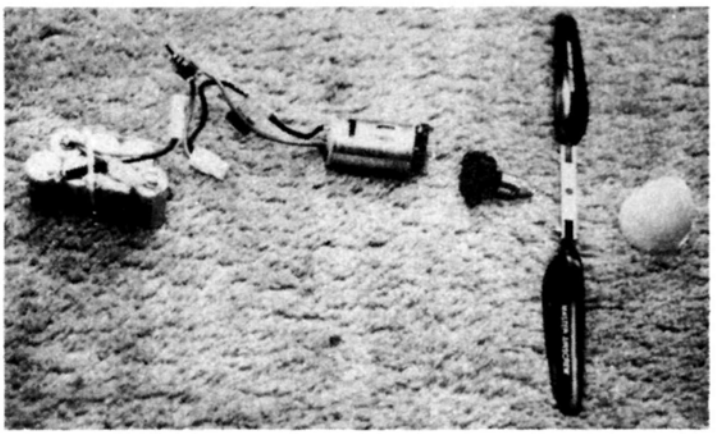
- Battery Pack: The plans call for seven 800mAh cells, but 1200mAh cells are easier to come by, and they'll fit into the airplane. Remember that the cells are soldered together in series (+ to -, + to -, etc.). Use the configuration shown on the plans. In the car section of your local hobby shop, you'll find the nice flexible braid I used for my connections. I also used two female plugs on the battery pack, so I can charge the pack without unplugging the motor.
- Wing: The Eclipse has built-in washout, which means that the center part of the three-piece wing is flat, and the airfoil on the two outer wing panels twist upward slightly at the trailing edge from the flat bottom—very nice indeed!

The wing panels are usually taped together when the wing is assembled. I put a little piece of toothpick on the bottom of the spar near the seam between the wing panels and used a small rubber band instead of tape, and this worked great.

As you might guess, the batteries get very warm during rapid charge and discharge. The kit has no provision for air ducting



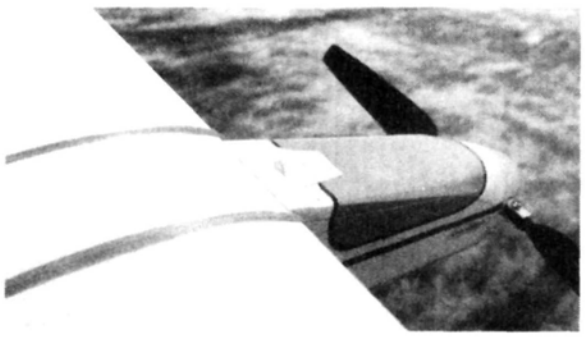
Electronics "module" consists of three servos, battery pack and receiver mounted on a single board.



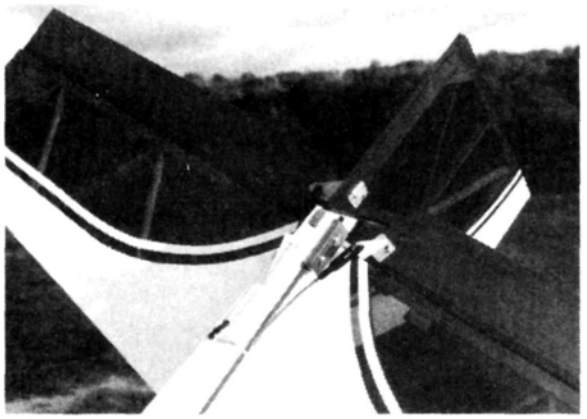
Propulsion end of the package includes battery pack, motor, gear-reduction unit, folding Master Airscrew prop and spinner.

ECLIPSE

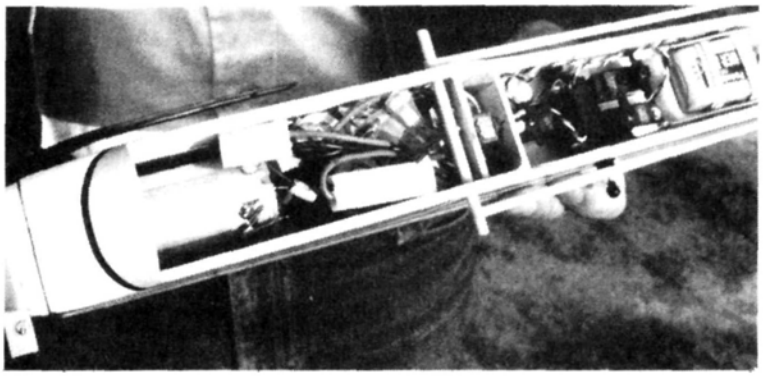
Neat method of outer wing-panel retention consists of a pair of wire "pins" connected by rubber bands. Much more "reusable" than taping every time.



The author added a sheet-plastic air outlet to the forward part of fuselage. Allowing cool air to flow over batteries extends their life.



Close-up of tail shows control linkages, antenna attachment to skid and a small amount of ballast added to get CG position correct.



Equipment area in fuselage isn't abundant, but it's adequate for the requirement.

through the motor and battery compartment. I made an oblong hole below the motor cutout in the F-1 former, and I used the area below the spinner as an air scoop. I put a little piece of scrap plastic on top of the cover plate as an exhaust port. Proper cooling of the batteries will not only enhance performance, but will extend battery life as well, which is why most modelers use air ducting in electric airplanes.

Another small thing you should be aware of: The horizontal stabilizer/elevator parts are cut from 1/8-inch balsa. This thickness may present hinging problems. I chose the small, Flex-Point hinges from Klett*, which made things a bit easier.

• Radio Gear: Standard-size servos and receivers will fit inside the radio compartment, but the 500mAh receiver battery pack must be a square configuration (not flat). Weight and space can be conserved by using a battery eliminator circuit, which you can find in the car section of your hobby shop. This device allows the electronics to be powered by the same battery pack that supplies current to the electric motor used for propulsion.

PERFORMANCE: The big day arrived, and it was time to fly the new plane. I'm a firm believer that you gotta fly 'em eventually, so why delay?

The smiling face would seem to indicate that our reviewer was pleased with the Eclipse!

The instruction book is very helpful, so follow the recommendations for control-surface throws and CG. My Eclipse was set up exactly by the book.

After double-checking *everything* at the field, I was ready for the first flight. I advanced the throttle stick on the transmitter, and a trusted flying buddy gave me a beautiful hand-launch. My plan was to let the plane settle and pick up a little speed before climbing to avoid a possible stall—wrong! The Eclipse hit the tall grass at the edge of the runway. This is typical for me, so I wasn't surprised! I figured that it needed a little more up-trim on the elevator and that I'd have to get on the elevator a little sooner on the next flight. There was no damage to the Eclipse as the result of this little mishap, which speaks well for the ruggedness of the airframe.

At this point, I discovered the purpose for the fuse on the motor: If the propeller is forcibly stopped, the fuse blows; it's a very good feature that protects the battery pack and wiring. Naturally, I didn't have

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HOW I SURVIVED

(Continued from page 85)

a situation like this, take the throttle off and pull up-elevator.

First Float Flight

My cabin is near a secluded mountain lake, and float flying intrigued me. How ideal—all this water for a landing strip and no obstructions! For my next flight, I fastened gigantic, homemade Styrene shrink-wrapped floats to the Tooter landing gear.

With over-size floats, I knew that it would never take off from the water, so the R/C aircraft carrier was put into service (a 20-foot pontoon boat). With the carrier at half speed, the Tooter lifted from my hand without a throw. The flight was wonderful, except that the tremendous drag of the floats required full throttle to keep the plane in the air.

When landing a floatplane, it should be at a fast idle with wings straight and level with a light flare just before touchdown. Since my flight instructor was still 150 miles away, my first landings on water were without any power or flare. The Tooter just bounced a few times on the water, but it was ready to be picked up by the carrier for another flight.

A Word About Dihedral

The Tooter is designed with large wings for slow flight and excellent visibility. To fit the airplane wings in my car trunk, I needed the split-wing version. A removable $^3/_{16}$x3-inch piano wire pin was used for the dihedral brace.

Parts are easily dropped while float-flying from a boat. When they do, they usually drop 135 feet! Yes, I lost my only dihedral pin overboard.

A quick search of our remote shop turned up a chain-saw file with the right dimension. Boy, was it hard to cut to size! Back on the lake, half way through a second loop, the hard but extremely brittle file snapped. The wings separated from each other and from the fuselage—the flight was almost over. A free-fall from 200 feet ended with the Tooter's wings and fuselage floating on the waves, waiting for the recovery ship.

A search of my neighbor's shop turned up soft copper wire about the diameter I needed. After another R/C carrier takeoff and a few minutes of flight, I noticed that the turns were sloppy and that the Tooter wasn't handling properly. Flying closer, I saw that the wings were slowly folding up, turning my plane into what looked like perked-up rabbit ears! Make dihedral

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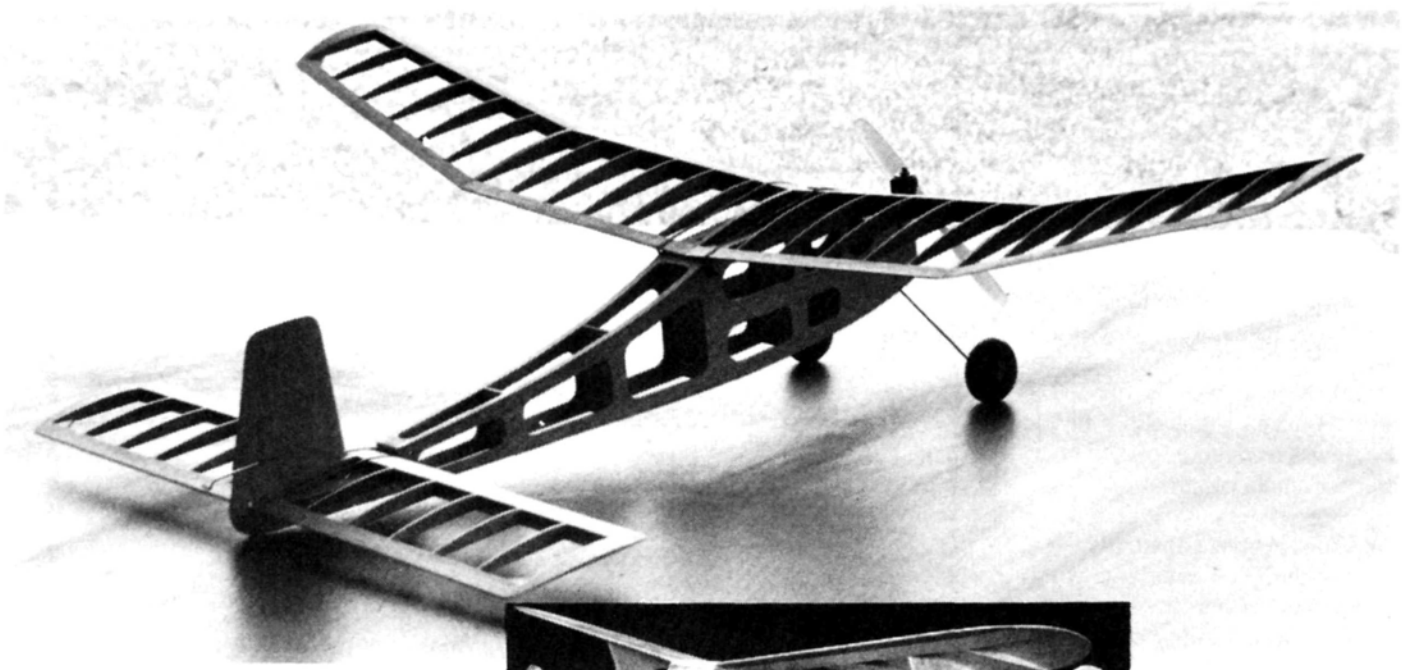
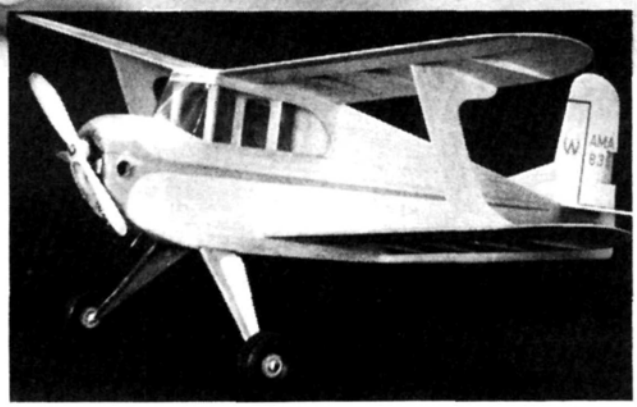
Building Model

by JOE WAGNER





Above: As this Comanche framework demonstrates, sheet construction can be lightened a lot by cutting good-size holes aft of the wing.

Left: This all-sheet-balsa Dakota biplane with its undisguised wood grain is a good example of a lightweight finishing technique.

MODEL AIRPLANE BUILDING requires time. (That's true of any worthwhile activity, of course.) A few modelers delight in lengthy projects; some even take *years* to complete their highly detailed and meticulously constructed miniatures. However, most R/C fliers don't work that way. We'd rather save all the time we can when getting our airplanes built, finished and ready to fly.

I'm like that, and in over half a century of constructing airplane models of just about every type, I've tried a great many shortcuts. Some worked very well for me; others didn't. The most effective ways to save time in building models are these:

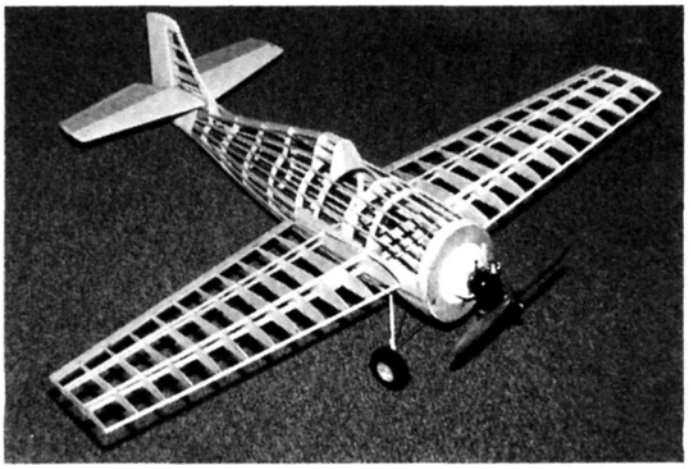
Don't try to save time. Haste makes just as much waste in model building as it does anywhere else. Rushing to get an airplane finished can cause errors that may doom it to destruction on its first attempt at flight. If you take your time to do a job right, you won't have to lose time doing it all over again. (If you *have* to complete your model by a certain date, such as for a contest, it's best to get an early start rather than to try to set a speed record for last-minute construction.)

Think the job out in advance. Visualize just what you want to accomplish and mentally go through the constructional steps needed. That way, you'll avoid wasting time doing things like cutting apart a ready-to-cover fuselage to install a forgotten control linkage.

Don't think things over too long. This is something I have to keep firmly in mind in my own modeling. Far too often, I've had a job to do that would only take 15 minutes or so to accomplish the "hard way," but I've spent a couple of hours or more trying to figure out a faster method of getting it done. For a kit or a magazine construction project, this might not be time wasted, but in a strictly-for-fun project, it's rather self-defeating.

Keep your working area as neat as possible. This is a tough thing for many modelers to do—especially me! I think I could have built *twice* as many models in my career if I hadn't wasted so much time searching for lost tools, model parts and templates among a heap of miscellaneous, piled-up, pushed-back stuff on my modeling workbench. Clean floors are important, too. You can find a dropped servo screw a lot faster if the area beneath your

Airplanes

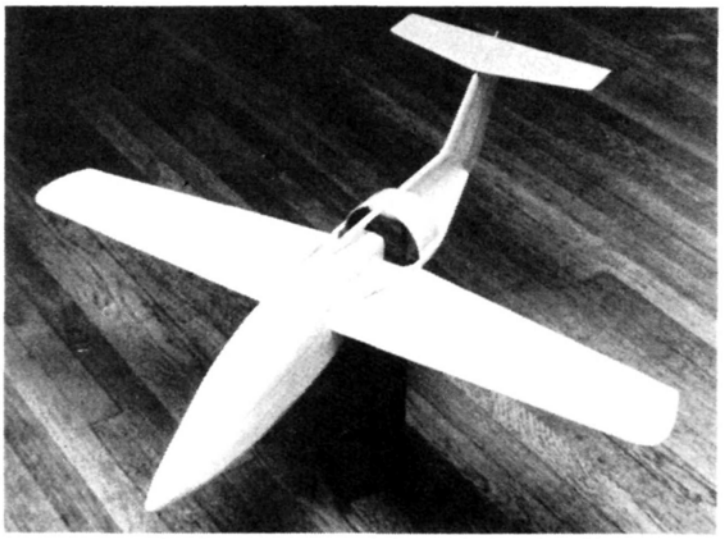


An all-built-up Grumman Wildcat by Little Rock modeler Dave Palmer shows off the sheer artistry in this construction method.

workbench isn't ankle-deep in balsa shavings!

Test new techniques before using them on a model. I well remember an occasion some years ago when a friend recommended a certain brand of polyurethane varnish as being "absolutely hot fuelproof." It was just what I'd been looking for. I bought some and used this "miracle" protectant to paint the front fuselages of a half dozen of my airplanes. Out flying a week later, I spilled a few drops of Cox Racing Fuel on one of these models, and the varnish blistered badly. I ended up having to spend a lot of time refinishing my six airplanes, and this was time I could easily have saved, if I'd only made a quick preliminary test.

Trying new methods and materials in advance is probably the best way to improve your modeling skills and learn what *does* and what *does not* save time. New tools, adhesives, covering materials, paints and decals—these often need a bit of getting used to until you're comfortable enough with them for them to reduce the time and effort (and money) you put into your model building.



Paul Willenborg's 1/2A semi-scale RFB Fantrainer is another out-of-the-ordinary R/C model from Little Rock. It's an excellent example of all-balsa construction; both light and strong. It will be featured as an upcoming MAN construction article.

Experimenting with new modeling tools and techniques needn't be difficult or expensive. The scrap wood that's such a common by-product of modeling provides plenty of material for test purposes. With this, you can try various adhesives and joining methods, check out cutting-tool effectiveness, and even build mock-up sections of structure to use in learning how new covering products and finishing materials behave. Psychologically, it's much easier to make radical experiments with something when it doesn't matter if it fails than on a major modeling project you've already put a great deal of time and money into.

Built-Up vs. Sheet-Wood Construction

Generally speaking, there are two main ways of constructing model airplanes, each with its own advantages and drawbacks. The built-up method is lightest and usually least expensive, yet it's the hardest to assemble, cover, finish and repair. For our R/C models, sheet-wood construction offers the benefits of ruggedness, ease of assembly and freedom from warps, especially for fuselages and tail surfaces, but it's usually considerably heavier than built-up work. This disadvantage is made worse by the fact that most of the solid wood is positioned aft of the model's balance point. This often necessitates the addition of a big lump of lead ballast to the fire wall to put the airplane's center of gravity (CG) at its proper location.

I've employed sheet-balsa construction in all kinds of model airplanes (even indoor rubber models) for a good many years, and by now, I'm rather familiar with how to use it to best advantage.

First: Most sheet-balsa model airplane parts should be made from quite light wood. Balsa's strength is proportional to its weight, of course, and it's tempting to use the harder, heavier grades to gain a stronger structure. But mechanical stress is also proportional to structural weight, so there's no net gain in useful strength

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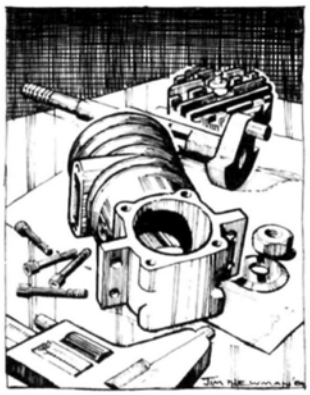


About Those En

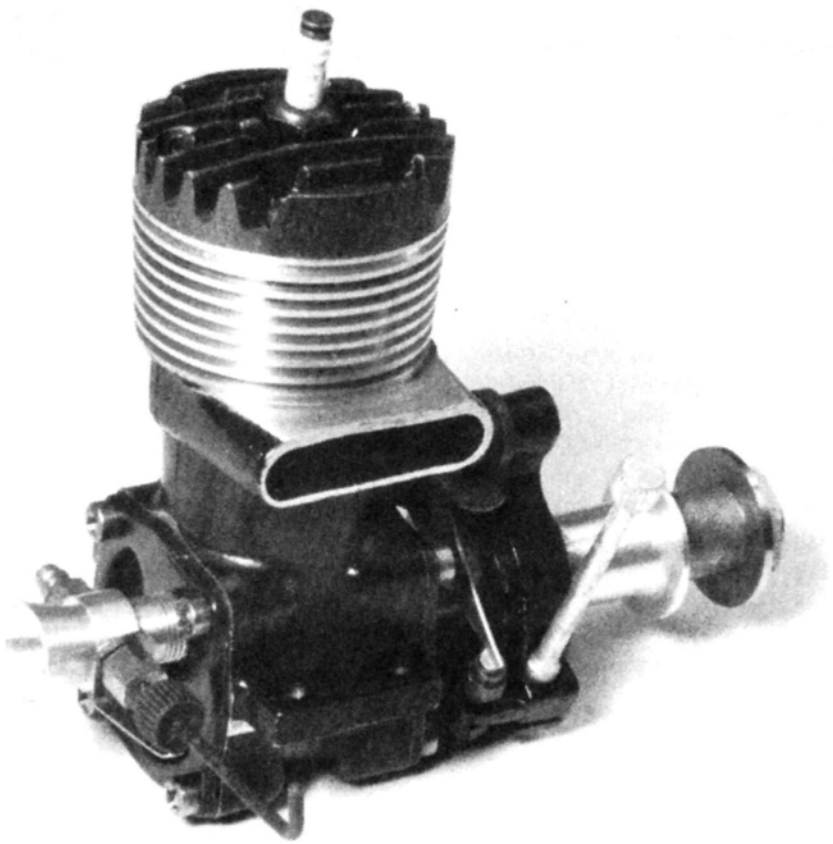
by JOE WAGNER

MODEL MOTORS are many different things to different modelers: They provide power for our airplanes; some of us admire them as working examples of mechanical art and ingenuity; others look upon model airplane motors as valuable collectors' items. Yet in one respect, all our miniature gas engines are alike: They're devices for converting chemical energy into useful horsepower output.

The chemical action involved is, of course, the combination of oxygen from the air with hydrocarbon compounds in the engine's fuel during combustion. Without this, there can be no power. However, in the operation of our miniature airplane power plants, their fuel may be the most misunderstood variable. In this column, I'll try to correct some common misconceptions about model engine fuels.

There are three distinct categories of these fuels: gasoline (for spark ignition), kerosene/ether (for diesels) and methanol/nitromethane (used in glow motors). Of the three, the one with the greatest energy content is gasoline. It has about 15,000 Btu per pound of the 3:1 gas/SAE 70 oil mix commonly employed in old-timer model engines. Next comes "diesel" fuel, with roughly 11,000 Btu to the pound. Glow fuel has the lowest energy content by far: only 7,500 Btu to the pound for a typical 10-percent nitromethane blend. Thirty-percent-nitro glow fuel contains a mere 6,500 Btu per pound—some 60 percent less than 3:1 gasoline-and-oil.

Yet we all know that a modern competition glow engine like a Nelson .15 can develop about eight times the shaft horsepower of a .60 gas-and-oil sparker, even though it uses fuel with less than half the energy content of gasoline. This seeming paradox is mainly due to the different amounts of *air* required for combustion. Gasoline and diesel fuels both need twice as much air (or more) for efficient burning as a high-nitro glow fuel does. This means that the power output of a model motor depends far more upon the amount of air it can pull in than on the energy content of its fuel.



With its black case and red head, this 1947 McCoy .49 is one of the prettiest model engines ever made, and, for its size, probably the most powerful, owing to its large intake port.

To boost model engine power, various methods of increasing air intake have often been used. Short, large-diameter venturis represent one approach and are used in the racing McCoy engines. Providing an additional inlet path underneath the piston at the top of its stroke is another method. This is exemplified in the 1/8-inch holes in Super Cyclone cylinders and the gap at the lower edge of Cox TeeDee exhaust ports below the piston skirt at TDC.

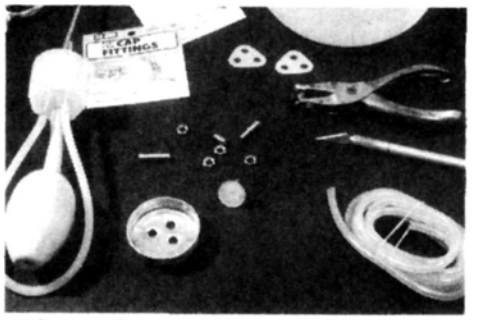
Methods such as these certainly help to improve model engine power. But the fact remains that in internal-combustion model engines, alcohol/nitro fuels deliver the highest output—at, of course, the highest fuel consumption. Model diesels and gasoline-burning spark-ignition motors will run more than twice as long on each ounce of fuel than glow-pluggers will.

The manufacturers' instructions for yesteryear's "gas engines" specified the use of "white gasoline" rather than "high-test." Many modelers thought this was to prevent spark-plug fouling from the lead content in high-octane gas. They used "ethyl gasoline" anyway, hoping for increased power. But actually, all grades of gasoline, whether high-octane or the old "white gas," have essentially the same energy content. True, the *engines* designed for high-octane fuel are more powerful, but that's because of their boosted compression ratios, not a more

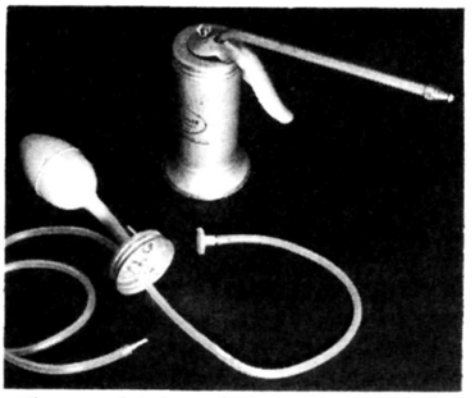
gines—

energetic grade of gasoline. Because it's harder to ignite, and thus resists premature detonation from the heat of high compression, 100-octane gas works well in high-compression motors. But this characteristic of increased-octane fuel makes it bad for model engine use. Easy ignition is the desirable factor here!

"White gas" was about 60 octane; today's lowest-octane gasolines are in the 80s. Using these in a 3:1 mix makes it harder to hand-start a gas-fuel engine now



What it takes to rework the stock Sig Pressure Pump for glow fuel (left) into one usable with any model fuel. (At upper right is the jug from which the sealing washers were cut.)



The completed gasoline/diesel pressure fuel pump. The old-style "squirt can" pump at the rear is far from airtight and should never be used for model fueling.

than it was in the good old days, particularly in cool weather. However, modern batteries and electronic components (e.g., Floyd Carter's transistorized ignition module mentioned in my previous col-

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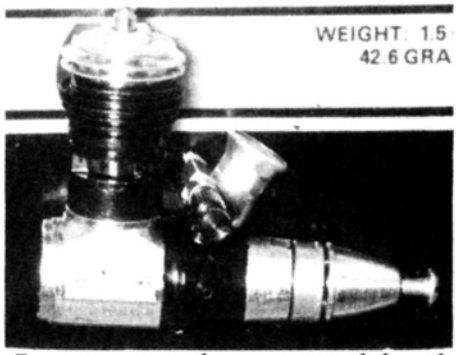
ABOUT THOSE ENGINES

umn) compensate somewhat for this difficulty. And a fuel that's quite similar to the old "white gas" is available today. Called Coleman Lantern Fuel, it's sold by sporting-goods dealers at about $5 a gallon.

Many modelers believe that fuel gets "stale" and loses its power with age. True, if not kept tightly sealed in metal cans, all types of model fuel will deteriorate. The highly volatile hydrocarbons in gasoline evaporate; glow fuel absorbs moisture



For more power, the narrow gap below the piston of this Cox Tee Dee .049 allows extra air intake at the top of the stroke.

from the atmosphere; and diesel fuel suffers from both these troubles. But if kept in well-sealed, lightproof containers, model engine fuels of all types can last indefinitely without degradation.

Modelers encounter more problems with diesel fuel than with glow- or spark-ignition types. The diethyl ether that provides the "ignitor" action in diesel fuel evaporates unbelievably fast, and its boiling point is only 94 degrees Fahrenheit. That's one reason model diesels have been less popular in the USA than in Europe, where summer weather is usually moderate. When it's hot, even an expert diesel man can have trouble with his fuel. At last year's Flying Aces Nationals (in Geneseo, NY) the temperature was over 100 degrees. Fernando Ramos, who brought his diesel-powered Sopwith Triplane all the way from California to compete, never succeeded in getting a decent engine run. No wonder! Besides the 100-degree-plus air, the radiant heat from the sun probably boosted the dull, dark-brown Sopwith's fuselage interior to over 140 degrees. Diesel fuel *can't* take that kind of punishment.

Yet there are ways of overcoming problems like these—at least to some extent. For one thing, reducing diesel fuel's exposure to open air will noticeably reduce ether evaporation. On a warm day, merely

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HOW I SURVIVED

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brace pins out of piano wire only —and make a few extra.

Surroundings

Flying your first airplane takes a lot of concentration. You're learning eye and hand coordination based only on sight and sound. You must be aware of the location of your craft in relation to the horizon which is your reference line. Fly above this line, but not over your head, and never into the sun. Fly high enough so that, even with a few mistakes, you still have altitude for corrections.

When landing, be aware of your surroundings. Plan your approach before you get there. Glance forward for buildings, trees, people, etc. One of my unpowered landings flew my Tooter into the open window of my car. Another landing just missing the car, but hit the radio antenna. Fortunately, neither landing hurt the plane or the car. Safety for others and yourself should be the first concern. Let the instructor land your craft until you can safely control it.

Looking Back

Looking back on my first year of flying, I see tremendous enjoyment in the hobby, but I also see my mistakes, which are commonly made by first-time fliers. I would have lost interest in R/C, if it hadn't been for that perfect first airplane, the Tooter.

Scratch-building gave me insight to a very pleasing and rewarding side of this hobby. The slow flier gave me time to learn how to react to the movements of the airplane and the light but strong design allowed me many months of learning the dos and don'ts of R/C.

After over 150 flights, I retired the Tooter, but I didn't give it up. I built a second one with a redesigned fuselage front and a shorter wing with ailerons. An O.S. .15 engine flew it faster. With the greater aerobatic capabilities, it taught me rolls and other tricks that your first trainer airplane isn't (or shouldn't be) capable of.

The Tooter was the basic groundwork that advanced my building and flying skills. I progressed to a Great Planes* Trainer 40 flown from land, snow and water. It bit the dust owing to improper elevator hinge installation, so be sure to work slowly and install your hinges with lots of epoxy. I built a Carl Goldberg* Electra next. It's a nice Sunday-afternoon school-yard quiet flier.

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HOW I SURVIVED

(Continued from page 97)

I now fly a Great Planes Super Sportster 40, my first low-wing airplane, and it's teaching me many things. My newest airplane, the Carl Goldberg Anniversary Edition J3 Cub on floats, is still in the workshop.

You have to learn how to walk before you can run. In radio-control, start with a proven trainer—the Tooter. It's made my first year in R/C a success.

**Here are the addresses of the companies mentioned in this article:*
***Coverite,** 420 Babylon Rd., Horsham, PA 19044.*
***O.S.;** distributed by Great Planes Model Distributor, P.O. Box 4021, Champaign, IL 61820.*
***Futaba Industries,** 4 Studebaker, Irvine, CA 92718.*
***Carl Goldberg Models,** 4734 W. Chicago Ave., Chicago, IL 60651.* ■

ROBBE ASW-24

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dated a regular-size servo for the flaps. As I mentioned earlier, for more efficiency, I chose to use the larger spoilers instead of the recommended smaller ones, and these proved to be just right.

All the flying surfaces were covered with white EconoKote*. I cut hinges from MonoKote* trim sheets, instead of using the hinge tape that was suggested. The supplied control horns were installed at this time, followed by the installation of the radio.

Rather than adding extra nose weight, I chose to put the SR* 1200 mAh battery pack at the most forward part of the nose, so that only 6 ounces of lead were needed for balancing.

The decals furnished with the kit were not scale registration numbers, so I decided to copy the numbers from a brochure I'd received from the manufacturer of the full-scale ASW-24, and I ordered a set of numbers from Vinylwrite*, which were of excellent quality.

PERFORMANCE: This is the part that makes all the work worthwhile! After checking out all my equipment, it was off to the field for my first test flight. This happened to be the day of our club's New Year's Day Champagne Breakfast at the field. It was bitterly cold that morning, but that wasn't going to deter me! After the procedural range check, I scouted out an experienced assistant to give my model a good, straight hand-launch into the wind. The "24" glided across half the field (which is over 1,000 feet long!) and landed perfectly. Now I knew it could handle the winch. Just as I was about to launch it, one of my aileron servos started to perform intermittently (probably owing to the cold weather), and this abruptly ended my winch-launch for the day. That night, I replaced the aileron servo.

The next day was unusually pleasant and warm—ideal for test flying. On arriving at the field, I found only one flier making a test flight—even more ideal, since I prefer a minimum audience in situations like this!

The first flight was performed off the forward hook to get the feel of the launch. Although T-tail gliders often drop their tails, the "24" went straight up with no such tendency. To my delight, it performed just like a full-scale sailplane. When I made my approach to land, it was so quiet at the field that I could hear the wind whistling over the wings—an exhilarating sound. The following flights were launched with the rear tow hook and 45-degree flaps: This gave the "24" an even steeper climb, still without the tail dropping! The only trim required was a little left aileron, and this resulted from one wing panel being slightly heavier because of the servo change made the night before. In my haste, I'd forgotten to balance the wing again. It also required more rudder throw—approximately 45

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Quiet Flight

by JOHN LUPPERGER

Steve Bell holds his good-looking original design 2-meter. See text for details.

DO YOU ENJOY YOUR hobby? Does it give you a sense of satisfaction? I'm asking these questions because I'm wondering if you've given anything back to your hobby. Have you helped a newcomer lately? Have you tried to involve a youngster in your R/C activities? Has your club or flying group ever organized an event to raise money for a local charity? Not only are these actions personally satisfying, but they can also show the general public that R/C is something more than a bunch of men playing with "toys." Give something back; your gain in return will be tenfold.

Software from Germany

I recently received a sample of an airfoil program from Ludwig Wiechers of Germany. Ludwig's program is quite extensive and, if there's enough interest, he'll consider translating it into English. If the following sounds interesting to you, write to me directly and I'll pass it on to Ludwig. If there's enough response, I'll try to arrange distribution of the program here in the U.S.

The program includes these features:

- a collection of some 250 airfoils, including all modern Eppler, Quabeck, Girsberger, Hepperle, and Selig types; as well as older ones (NACA, Wortmann, and also some for free flight.)
- the ability to enter and edit airfoils
- a screen display of the airfoil (including close-up views of the nose section that are especially useful when you have to improve or change some of the coordinates to obtain really smooth curves)
- a good spline interpolation for screen display and printing/plotting
- output on 9-pin or 24-pin printers (as good as a plot) with the largest section 1000mm; plot output on all HPGL plotters
- file output of interpolated coordinates for further use in styro-cutting machines
- the ability to change thickness and camber
- calculating momentum coefficient for zero angle of attack and angle of attack for zero lift
- calculating transitioning sections when root and tip sections are different
- calculating the center-of-gravity position

As you can see, Ludwig's program is quite involved. I don't know what the cost is at this time, and it might depend on the number of people interested. One of the features that I like best (besides the file of 250 airfoils) is the ability to see the airfoil on the computer screen. It sure makes picking an airfoil quicker and easier!

Nats Update

By now, anyone interested in attending the Nats knows that the soaring events will be held individually on separate days. You won't have to haul each model out every day for one flight. Here's the schedule: Wednesday, Scale and F3B; Thursday, Unlimited; Friday, Modified Standard; and Saturday, 2-Meter (July 19 through July 22 in Richland, WA).

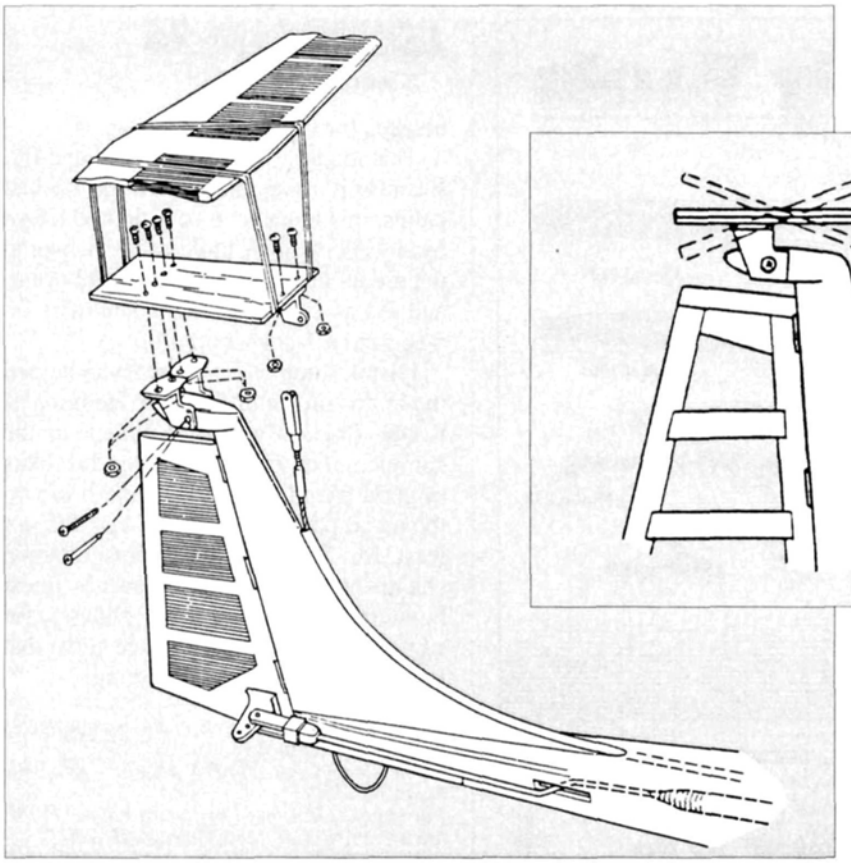
Tom Culmsee, soaring events director, feels that this format will put a stronger emphasis on the individual events—especially on Scale and F3B. These events are quite exciting in their own right and can now receive the attention they deserve at a national contest.

Some people are concerned about this format, but I think it makes a lot of sense from the organizers' point of view. Each event will be run, scored and finished in one day—quick and simple!

For the contestants, it should relieve some of the pressures involved in entering several different events. Instead of having *every* model (and back-up) ready for each day, you'll only need *one* model ready with back-up. This should eliminate some of the all-night repair sessions that I've heard about. Whatever happens, if you're attending, please come with an open mind, and try to help the organizers run a smooth event. Who knows, this new format might forever change the way the Nats are run!

English 2-Meter

Steve Bell is an English modeler presently living in the U.S. and working for an automotive design company as a design-concept modeler. I met him at the Harbor Soaring Society flying field in Costa Mesa, CA. He had brought his 2-meter



T-tail modification is well-illustrated in this exploded view. Uses simple, everyday hardware; pivots are made from cut-down control horns.

Side view of T-tail modification shows position of pivot point and control horn. Area of bare cable must be slightly larger than total servo travel.

original design model from England so that he could fly it during his stay here.

Two-meter has all but died in England as a competition class, but many modelers still fly it for sport. The class in England is restricted to rudder/elevator control only—no spoilers, no flaps, no ailerons and no room for growth!

Steve's model uses a wing that was originally from a Sitar Special and then reconfigured as a polyhedral model. It utilizes the Eppler 193 airfoil, which seems to be the airfoil of choice in England, whereas the Eppler 205 is the most popular here in the U.S. The fuselage is a fiberglass-pod-and-fishing-pole boom arrangement that's based on a design known as the Emerald. The rudder/elevator T-tail model uses a full-flying stab with a relatively long tail moment.

Although Steve flies Mode I (two-stick), he let me take the controls during one flight. I've only flown Mode I a couple of times, but I found Steve's model relatively easy to fly, mainly, I think, because of the model's long tail moment. This smooths control inputs and makes it hard to over-control, like the shorter tail moments found on most American designs.

T-Tail Mod

Once you get past the basics of building your first few models, you'll probably want to personalize your next model with some type of modification. One of the easiest ways to change a model's looks is by changing the tail shape or configuration, such as changing a conventional tail into a V- or T-tail. This is a fairly easy modification if you follow these few simple rules:

- Keep the overall area about the same as that of the original model.
- If it isn't a full-flying surface, keep the moving surface area the same.
- Make sure the decalage (relationship of the angle differences between the stab and the wing) remain the same.

If you follow these rules, you can really change the looks of your Wanderer, Gentle Lady, Two x Six, etc., without worrying about messing up its flight characteristics. Not only will your model look different (and better, according to those who love T-tails), but in some ways it might perform better, too.

On tow, when the angle of attack is extreme, the tail of some models will be blanked out by the wash of the wing. This can cause loss of elevator effectiveness and loss of altitude during launch. Because of the T-tail's high position, it will always be in clean air and remain effective even during a launch.

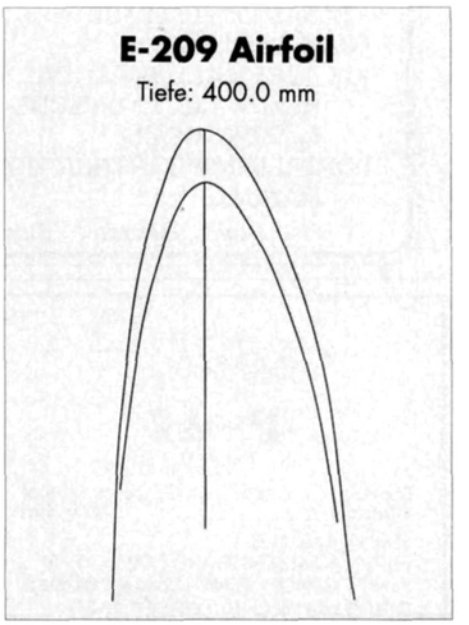
Since a T-tail is riding in clean air, it will also be more effective in normal flight. This will allow you to use less deflection in your elevator to get the same response that you'd get from a conventional low-mounted tail. Less deflection means less drag and better overall flight performance. If all this isn't enough, T-tails are just plain sexy-looking!

The T-tail modification shown was picked up from a very old Japanese magazine. I especially like it because there are no fancy linkages, bellcranks, tubes, or wires.

As you can see in the drawing, the whole setup is quite simple. The stab is rubber-banded to a plywood rocker plate. This plate needs to be wide enough to provide good support for the stab, and it should also equal the chord width of the stab. A piece about 3/32 inch thick should be adequate.

Use two large horns for the main pivots. These should be cut off just above the second or third hole. Mark the position of the bolt hole on the vertical stab and then drill. This is probably the most critical step and should be done on a drill press, if possible. For the stab to line up with the wing, this hole needs to be at 90 degrees to the vertical surface. Use a small bolt with a locknut, and tighten the nut just enough to keep it from locking the horns

(Continued on page 144)



Sample plot of Eppler 209 airfoil section on a nine-pin and a 24-pin printer. Ludwig Wiecher's airfoil program also displays the foil on the display screen—a very handy feature not usually found on other programs.

ROBBE ASW-24

(Continued from page 99)

degrees for tighter turns.

This model was a joy to build and fly. Because it's very stable and has no bad habits, this model can be built and flown by any intermediate builder/flier. I entered the model in the WRAM show this year, and I was fortunate enough to win 1st place and a 7-channel radio!

I thank some of the people who helped me in this project: Mr. Frank Heinrich of Robbe (for his technical advice in the completion of the kit); Mr. Ray Juschkus (a good friend, who did a superb job on the aerial photography); and last, but not least, Mr. Terry Luckenbach (a national champ and one of the country's finest builders and fliers of scale gliders), for inspiring me to build a big scale glider that looks and flies like the real thing!

**Here are the addresses of the manufacturers mentioned in this article:*
Robbe Model Craft, *180 Township Line Rd., Belle Mead, NJ 08502.*
Formula U; *distributed by Pactra Paints, 410 N. Michigan Ave., Rm. 1280, Chicago, IL 60611.*
Sullivan Products, *1 North St., Baltimore, MD 21224.*
EconoKote and MonoKote; *distributed by Top Flite, 2635 S. Wabash Ave., Chicago, IL 60616.*
SR Batteries Inc, *P.O. Box 287, Bellport, NY 11713.*
Vinylwrite Custom Lettering, *16043 Tulsa St., Granada Hills, CA 91344.* ■

R/C ON A BUDGET

(Continued from page 51)

This brings me to probably the most important feature of being cheap. I know what I'm about to say is a paradox, but if you'll bear with me for a moment, you'll understand what I mean: Always have some "airplane money" you can spend! Brilliant statement, isn't it? I've bought out several people who were getting out of the hobby, and I only clinched the deals because I had cash in hand. I've also had to pass up some excellent deals owing to lack of funds. (That really *hurts!)*

Keep the cash flow going by selling the items you've fixed, but don't want to use. I don't fly Futaba, EK, or Heath radios, so I sold them. I don't fly 1/4 scale either, so I sold the Nosen trainer. As a matter of fact, I kept very little from that first deal, but it allowed me to move to other things. Have the money there for when the good deals come around. Of course, "deals" don't fall into my lap *every* day, and I've lost money on a few of them, but I sure do have fun. That's what it's all about, isn't it?

If you're willing to invest your time,

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R/C ON A BUDGET

(Continued from page 102)

you'll find that a lot of people will pay you for it in one way or another. Know your limitations, but don't put a lid on your potential. Ask questions! Be friendly and helpful! If you're on a budget like me, repairing damaged airplanes may be your thing, too. Like me, you might soon enjoy finding the deals almost as much as the hobby. I have to go; just read about a Byron F-16 for $50 in the "Buyer's Guide," and I must check it out! ■

COX TYPHOON

(Continued from page 58)

receiver and its battery have to be placed side by side right up against the back of the fire wall, in such a way that they can't shift in flight. The instructions tell you to do this by inserting the receiver and battery, each wrapped in foam, into the nose section via the cockpit area. This meant working blind in a narrow cavity 6 inches deep. I don't trust myself to achieve a good R/C system installation unless I can see *exactly* what I'm doing, so I took off the Typhoon's fire wall (which is held in place with four screws, plus a sealant that's easy to remove), and I put the receiver and battery in from the front.

Without the sealant, fuel and exhaust residue can, of course, seep behind the fire wall but even *with* sealant, leakage can enter through the nose-wheel strut mounting. I wrapped the receiver and battery pack in plastic baggies before enclosing them in foam and putting them into the airplane. The foam furnished in the kit was far too soft and thin to give protection against impact or vibration. Instead, I used polyethylene plastic foam: the white stuff that some R/C suppliers use to protect their equipment during shipping. This material is thin, light and non-absorbent, and it protects against shock far better than thin foam rubber.

Built according to the instructions, my Typhoon balanced perfectly with the four-pen-cell battery box that came with the Cox Cadet radio I used. But since I prefer Ni-Cds, after establishing that the balance was OK with pen-cells, I replaced them with a 550mAh Ni-Cd pack.

One other change I made (and recommend) was installing a vertical whip antenna instead of the wire-down-the-fuselage antenna called for in the instructions. I prefer whip antennas, but the Typhoon has metal pushrods that run right alongside the recommended antenna installation. It might work all right, but I didn't want to gamble. (The whip gives better reception anyway.)

PERFORMANCE: The finished Typhoon is a work of art. One R/C pilot who has seen a full-size Taifun told me my model was almost *exactly* like the prototype. But this turned out to be not so good when it came to flying. I think the model was designed too close to scale without enough thought for its flight characteristics. The thin wing (which uses an Eppler airfoil intended for much larger aircraft) has 310 square inches of area. That sounds like plenty for a 26-ounce airplane, but because its airfoil is so thin, the Typhoon's wing only lifts about two-thirds as well as it could with a thicker, more conventional airfoil.

Thin airfoils stall more easily than thick ones, particularly with small-chord wings. To avoid the problems this can cause when maneuvering, most similar R/C model designs (e.g., Goldberg's Gentle Lady) have washout in their wing tips, and this puts the tip areas at a lower angle of attack. Thus, an entire wing panel is unlikely to stall all at once and throw the model into a snap-roll.

But the Typhoon's wings have no washout, and I snap-rolled my airplane trying to turn it too sharply close to the ground. I must admit that the instructions specifically warn against tight turns and steep banks. I should have paid attention! I'm too accustomed to being able to pivot my own 1/2A R/C designs practically on a wing tip, and I let habit take the place of "flying by the book."

One of the Typhoon's wings broke in the crash I mentioned. For $50, a replacement wing set is available from Cox (as are all other parts). This seems like a lot, but if you consider that your time is worth $10 an hour (or more), you'd have a hard time building a set of wings like the Typhoon's in less than 5 hours. I know I would!

When I got the new wings, I noticed something I should have seen much earlier. The pictures on the kit's box—particularly the in-flight photos—show a lot more dihedral than my model had. So before I installed the new wings, I re-bent the wire dihedral brace to give 7 degrees dihedral to each side. This is twice as much as the model had when I first assembled it, and it leaves a noticeable gap at the underside of the wing roots. But "aileronless" R/C models need quite a bit of dihedral—low-wingers especially.

I wish I'd made this change the first time around, because now the Typhoon is a great deal more tractable. I still fly it with care: The thin, "unwashed" wings

(Continued on page 111)

COX TYPHOON

(Continued from page 105)

make me fearful of another low-altitude snap-roll. I keep my turns gentle, as the instructions recommend, and the Typhoon flies very nicely indeed.

It's a picture of grace in the air. With a Graupner 7-3 prop on the engine instead of the 6-inch flexible plastic prop that comes with the kit, it easily takes off from a smooth runway. The nose wheel isn't steerable, but by using a little back pressure on the stick, the nose gear can be "unloaded" enough to steer the airplane by rudder at any speed over about 5mph.

The instructions recommend that you hand-launch this model. Its tiny wheels won't roll well over anything but a smooth surface, and taking off from grass is out of the question. The one-handed launch method shown in the Cox booklet isn't quite reliable. Hand-launching is kind of an art in itself anyway, and holding the Typhoon well behind its balance point makes consistently aimed launches somewhat difficult. But supporting the nose with my left hand, while gripping the fuselage behind the wing with my right, makes the job much easier. I release with my left hand a little before I let go with my right; the initial motion, while supported fore and aft of the balance point, gets the airplane off and climbing out at the proper gentle angle. That thin airfoil stalls suddenly, and a launch that's angled too steeply can mean disaster, unless you're mighty quick on the elevator stick!

When landing, too, the controls need to be handled gently. The Typhoon's rudder and elevator are extremely effective. It doesn't take much stick motion to fly this model, and over-controlling close to the ground can make for expensive repairs. (The structural materials used in this airplane cannot be glued reliably with any adhesive in my shop.)

The Typhoon is an attractive airplane that's very responsive to both rudder and elevator inputs, so it isn't particularly suitable for beginners. In the hands of a flier with some experience, it's a fun motor-glider that's capable of small-field operation, and it can deliver economical flying fun.

**Here are the addresses of the companies mentioned in this article:*
***Cox Hobbies, Inc.,** 1525 East Warner Ave., Santa Ana, CA 92705.*
***Kyosho**; distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.*
***MonoKote**; distributed by Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616.*
***Carl Goldberg Models, Inc.**, 4734 West Chicago Ave., Chicago, IL 60651.* ■

KAVAN SHARK 40

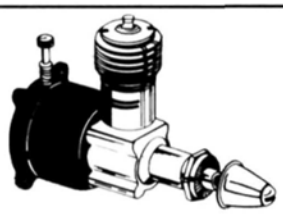
(Continued from page 65)

back slightly on the pitch and found the Shark *in the middle of a loop*. In the split second that remained, I found there wasn't enough ground clearance to recover, and I began a roll to the right. The tail rotor nicked the ground and in went the chopper. Of course, the crash *looked* bad, but in reality, all I broke was the tail rotor blades and the main rotor blades. I discovered that the helicopter was so tail-heavy that it was very prone to loop when it got into forward flight. It really caught me by surprise! Since then, I've added the gyro, a 1200mAh battery and 9 ounces to get this "Porsche of helicopters" to balance. The pictures of the Shark-40 in flight were taken after the crash and learning experiences.

If you really want a hot-rod helicopter, the new Kavan Shark-40 is just for you. It's the smoothest, most aerobatic helicopter that I've owned and flown. This Porsche of the air will turn on a dime and give nine cents change. But the Kavan is an exotic sort of machine, just like the Porsche, and if you like a challenge, go ahead and indulge yourself. You'll love it

(Continued on page 122)

Product News



COX HOBBIES .049 TEXACO

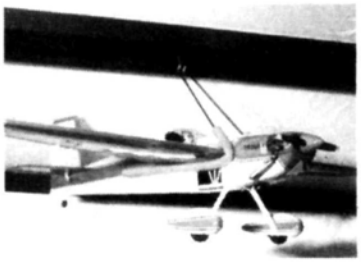
Cox Hobbies proudly announces its newest specialty engine, the Texaco .049. Working closely with the top 1/2A Texaco competitors in the country, Cox engineers have designed a unique extended-duration production engine that offers the special combination of fuel economy and power needed to win 1/2A Texaco events. The Cox Texaco .049 features a high-velocity .062-inch-diameter venturi, a new, free-flowing reed holder and a lightweight polymer tank back. The propeller rear drive plate incorporates a center boss to aid in centering different props. A 7x3 1/2-inch P prop is recommended, but not included. The red tank and black crankcase distinctively mark this new engine. Its rpm range is 9,100 to 9,600 with a 7x3 1/2-inch P prop; duration is 5 to 6 minutes; and the tank capacity is Texaco-regulation 8cc.

For more information, contact Cox Hobbies, Inc., 1525 E. Warner Ave., Santa Ana, CA 92705.

GREAT PLANES O.S. ENGINES EXPLODED-VIEWS BOOK

The premier edition of the *O.S. Engines Exploded Views* book is an invaluable troubleshooting aid and engine reference guide. The book contains exploded-view diagrams of 91 O.S. engines, including the entire FS, FSR, SF and Surpass lines, and most specialty engines. This in-depth manual is a must for the reference shelf, as it makes identifying parts quick and easy.

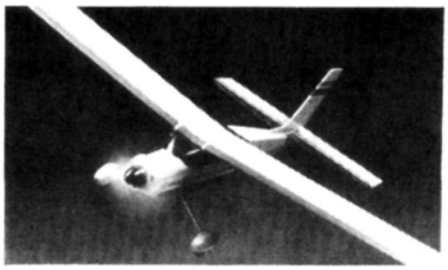
For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.



BIG SKY R/C HANGERS

Big Sky R/C has just designed the greatest hanger you've ever seen to display or store those precious flying machines from the ceiling. There's nothing to attach to the model, so you won't damage anything. The hangers balance perfectly and your model is protected by heavy tubular foam. They come in three sizes: small, .20-.40; medium, .40-.60; and large, .60-.80.

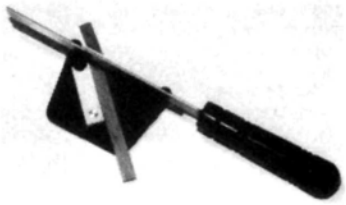
For more information, contact Big Sky R/C, Lander Indust., 1005-19th St. Ct., Havre, MT 59501.



CARL GOLDBERG MODELS THE MIRAGE

The Mirage will take off from a smooth grass runway; it will loop and roll from a shallow dive. Touch and gos are a dream! The Mirage is an all-around great flier, and it needs only two channels (rudder and elevator), but a third channel is recommended for throttle. As an option, a standard R/C car electronic speed controller really gives an additional dimension of control. The Mirage features a turbo 550 high-performance motor that's ready to plug in, and it flies great on a standard 6- or 7-cell R/C car battery pack. A complete hardware package includes propeller, spinner, super-light foam wheels, wheel pants, screws, etc. All you need to complete the Mirage is a radio, battery, glue and covering.

For more information, contact Carl Goldberg Models, Inc., 4734 W. Chicago Ave., Chicago, IL 60651.



DESIGN ENTERPRISE MITER MAGIC

This miter fixture offers a different approach to cutting angles. It's a small (2 1/4x3 1/4-inch) fixture that's used with your razor saw, and the basic unit can be used by either right-handed or left-handed modelers. The saw remains constant in relation to the body, and the material is moved through the desired angles. The open construction eliminates wood build-up behind the pieces to be cut. The backing is covered with abrasive paper, so the fixture remains stable when in use.

For more information, contact Design Enterprise, Rt. 5, Box 10, New Richmond, WI 54017.

PRODUCT DESIGN INC. AERO ZETA SPEED CONTROLLER

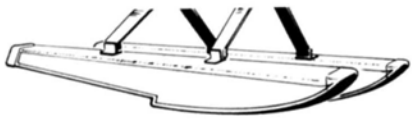
Product Design Inc. announces the addition of the Aero Zeta to its existing line of high-quality electronic speed controllers. The Aero Zeta is especially designed for high-performance electric airplanes that use either folding or feathered propeller designs. The small, lightweight and highly efficient Aero will run on 6- to 20-cell batteries and has a built-in electronic brake. It uses the receiver battery pack to power the control circuits, and will extend your flight time owing to its efficiency and because you can run at half throttle when you need to. Don't be satisfied with an on/off switch as a throttle when you can experience the real thing!

For more information, contact PDI, 16922 N.E. 124th St., Redmond, WA 98052.

D&R AIRCRAFT P-47 THUNDERBOLT

Because of its popularity, the "new" P-47 Thunderbolt has already undergone some significant changes and updates. The P-47 Jug now sports a 90-inch wingspan with a 1600-square-inch wing area. Recommended engines are the S-3000 to the G-62, and all-up weight is 18 to 22 pounds. This is a 1/5-scale kit that's complete in every way, easy to assemble and almost ready to fly. Features of this fine kit are: fully sheeted fuselage and wings; beautiful fiberglass cowl; canopy; decals; and all the hardware needed to complete the kit. Each kit is cut and assembled by hand.

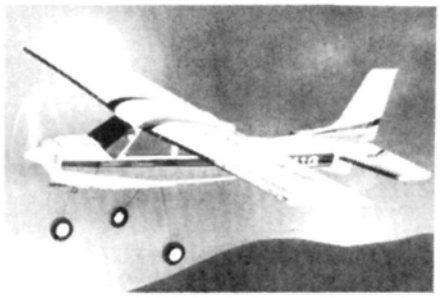
For more information, contact D&R Aircraft Mfg., P.O. Box 23056, Austin, TX 78736.



ACE R/C ARF FLOATS

With this complete line of rugged, white ABS plastic floats that go together quickly, anyone can have any plane in his or her stable on the water in one short evening! A specially molded joiner strip allows quick assembly of the halves; installation of end caps and a step reinforcement complete the job. Molded "T" parts are placed at the appropriate location to accommodate any landing-gear setup. Since all the float parts come molded in white, they can be painted or left as-is. An optional water rudder is shown on the instructions (no parts or hardware are furnished). Four sizes are available to cover almost any airplane requirement.

For more information, contact Ace R/C, Inc., 116 W. 19 St., P.O. Box 511, Higginsville, MO 64037.



STARR ENTERPRISES STARR-TEC AVIATOR

Starr is proud to introduce the Starr-Tec Aviator. This electric R/C plane with 34-inch wingspan is ready to fly (with a 60-second wing installation) and includes battery pack, charger and radio. The Aviator's favorable power-to-weight ratio allows it to be airborne in as little as 100 feet, so it can be flown in small parks or parking lots. It's also capable of takeoffs from asphalt .

The biggest fear of the first-time flier is that of crashing and losing his investment. In response to this, Starr is introducing the industry's first crash warranty. The package includes duplicates of the parts that are most likely to break in a crash. Because of the Aviator's modular construction, these parts can be snapped in on site, and flying can be resumed without disappointment. If a part that's not included with the set breaks within the first 30 days of ownership, Starr will replace for only a small postage/handling fee.

For more information, contact Starr Enterprises, Inc., P.O. Box 170, Deerfield, IL 60015.

ROYAL POWER PANEL

The Royal Power Panel will operate your starter, pump and glow clip from one 12V power source. The panel's narrow profile and convenient mounting holes make for easy field-box mounting. The unit also features metered glow-plug current adjustment and provides complete control of fuel pump and metering of plug condition.

For more information, contact Royal Products, 790 West Tennessee Ave., Denver, CO 80223-2875.

SIG MANUFACTURING BLUE MAGIC

Cleaning up a greasy, dirty model airplane after a flying session is one aspect of the hobby that isn't much fun. After years of trying different soaps, solvents and miracle cleaners, the Sig Factory Fliers came up with an economical "home brew" formula that really cleans off the crud. Simply spray it on and wipe it off! Blue Magic Model Airplane Cleaner cuts through the dirt and oil for a quick cleanup. It safely removes messy exhaust residue without harming painted model finishes or plastic iron-on coverings, and it leaves your models clean and shiny with no streaky residue. At last, designed exclusively for cleaning model airplanes at the flying field, here's an effective product that's non-hazardous, inflammable, biodegradable, odor-free and inexpensive! Blue Magic is 100-percent guaranteed to do the job. It's available in a handy spray bottle and economical refill sizes.

For more information, contact Sig Manufacturing Co., Inc., 401 South Front St., Montezuma, IA 50171.

Floating Around

by JOHN SULLIVAN

Bill Price's twin .40-powered Grumman Albatross streaks across Lake Hennessy. Kits available now.

IT'S SUNDAY MORNING at the lake and yours is the first flight of the day. The water is dead calm and a half a dozen guys are behind you in the pits talking about what happened during the week, while you execute one of the most perfect takeoffs of your career. The actual separation of float and water is so finite that it literally takes 50 feet to define. One of the guys notices this and begins to watch your flight.

This is the same plane you flew last weekend. All the trims are in the correct setting and your flight immediately takes on the aura of an aerial ballet by Hanno Prettner. Now only two guys are talking. The other four are watching as you bring your plane down from altitude in a victory roll that fans the shoreline with the prop tips screaming.

Now the pits are silent. All six guys are watching as you roll into a wide, flat procedure turn and set up for a landing. You hope that somebody's got a camera out as you throttle down and begin to lean on up-elevator. You're cocky, so you gun the engine a couple of times to extend the flare, then drop to idle while watching the plane and its reflection come closer together as they skim across the lake. Suddenly, thawack! The plane hits the water so hard that it rebounds 15 feet into the air with the floats wobbling from the concussion.

Someone behind you starts to laugh (these are true flying buddies). You gun the engine, put the nose down to avoid stall and hit the water again. Now all six guys sing out in chorus every time your plane hits the water. "One! Two! Three! Four!" Finally, the big judge in the sky recommends clemency and on the fifth smack your plane stays down and water loops to a stop with the engine out.

At this point, you have to turn around and face the guys who are laughing and screaming so hard that the local ducks are flying away. What happened? Fortunately, if you read this book I'm about to recommend, you can turn to these clowns and explain that you have just experienced the single most deceptive phenomenon experienced by the seaplane pilot: a flat, calm condition known as glassy water.

As the shrieks and guffaws diminish, you can go on to explain that a mirror-

Bill Price warms up the Albatross's Twin O.S. 40 FPs, while Dick Lemme holds it. Functional retracts will be available for the kit.

like surface tends to relax a pilot rather than alert him, while unknowingly, the pilot's depth perception has failed, making it extremely difficult to flare or round out the aircraft in time. Finally, as your six detractors listen with rapt attention, you can go on to explain that glassy water accidents are caused by the pilot misjudging his plane's height above the water. He either flies into it as you did, or stalls out above it! The correct approach, had your senses not been so lulled, would have been a power-on landing executed over at least 100 feet.

This, and hundreds of other face-saving tidbits are contained in a book that I highly recommend, entitled "How to Fly Floats," put out by the EDO Corporation*. It was written by Jay Frey, the president of EDO's float operations. Except for the much higher power-to-weight ratios model floatplanes have and the enhanced performance we enjoy as a result, this book is a carbon copy of the model floatplane flying experience.

Foam-Cutting Techniques

In our gallery this month is a picture of an inverted float with a foam block in front of it. Let's talk about the block first. I've recently discovered a new method for one-off cutting of foam which might be a boon to those of you who hot-wire your own shapes. Simply put, the method involves gluing a strand of 24-gauge wire to the foam to use as a guide for the cutting wire. The only glue I've found to work in this situation is the new UFO Thick from Satellite City*. It doesn't attack the foam and it holds the wire in place until you're ready to rip it off. The parabolic cut I made in the demo block looks burned, and it is, because I went over the wire guides three times to see if I needed to worry about overburn on the other side of the 24-gauge wire. As you can see, the adjacent area was totally unaffected.

I'm currently using this method to hot-wire a prototype 8-foot-span Pilatus Turbo Porter we're considering offering as a kit. The wire-guide method works well. If you want to cut out a wing, you simply draw the root and tip on opposite ends of the block, glue wire to the outline, and proceed to cut. Fuselage, turtle deck, cowl and empennage areas are done the same way. So, try this. In a one-shot situation you can say goodbye to hot-wire templates forever!

The inverted float is also pictured to show you a new bottom configuration that we've been working on. I got the idea while touring the San Francisco International Boat Show. Two of the hottest and newest boats at the show featured this configuration. Basically, it combines a float-bottomed pie-shaped section with a 10-degree constant dead-rise vee-bottom and the objective is to combine the admitted efficiency of a flat bottom with the soft-ride capabilities of a vee-bottom. We currently have two planes equipped with this new float configuration approaching flying stage. I feel that if we can come up with the same centers of pressure, lift and buoyancy that our flat-bottom float enjoys, we'll really have something that will satisfy both sport and scale float modelers. I'll keep you advised in future columns.

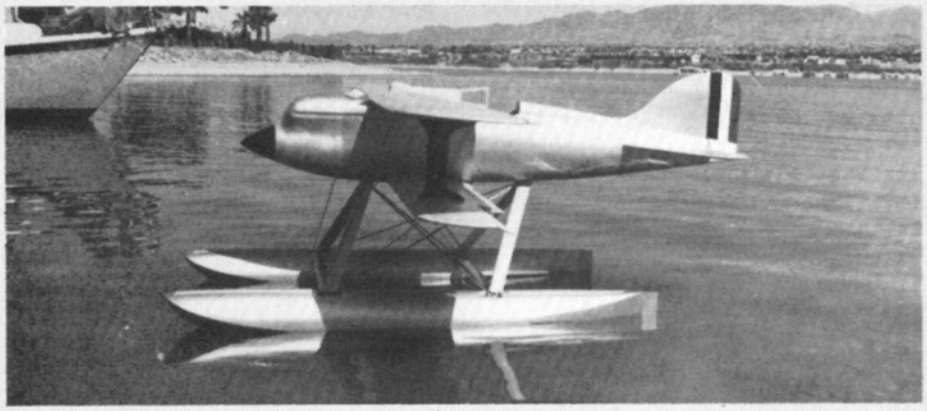
New Amphibian

Also pictured this month are a couple photos of Bill Price's latest amphibian, a twin-powered Grumman Albatross. Bill already kits a .40-size PBY, and by the time you read this, the Albatross should be in production. The pictures are shot on the Twin's second outing, which was reserved for high-speed taxi and first-flight tests. This plane is a blast! The red, white and black color scheme is one of the most striking that I've ever seen. The Twin is powered by a pair of O.S.* 40 FPs and

(Continued on page 118)

Dawn Westwood proudly displays her father Ed's 40-size deHavilland Beaver. Watch for construction article in MAN.

Bill Curry displays his Macchi M-33. Scratch-built project will be entered in the Lake Havasu Classic.



A 1/3-scale Curtiss R3C-2 rests in Sailboat Cove, Lake Havasu, AZ. Schneider entry is a grand effort by Bob Martin, Bob Jones, et al.

flies like a pattern ship on its 82-inch wing. We didn't get to mess around with the flaps too much, but aileron control is good right down to flare, and the tip-float position and rake are perfect. Look for a review of this plane in our upcoming special float issue in the September '89 issue of *MAN*. For those of you who want a head start, contact Bill at (707) 965-3866.

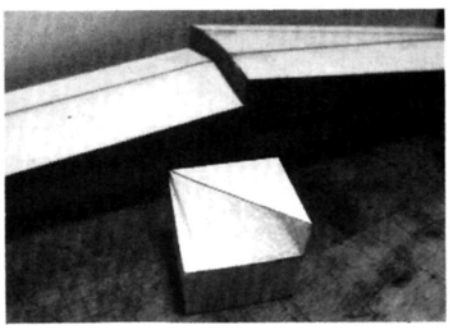
New Beaver

We'll also have a complete construction article on Ed Westwood's new .40-powered deHavilland Beaver in the float issue. I couldn't wait that long and wanted to at least show you a picture of Ed's daughter, Dawn, holding the Beaver high on a misty Washington winter day. The Beaver is finished in white, Cub yellow and black and looks absolutely gorgeous. Ed has been writing to me regarding the construction of the Beaver. He met all of his design goals, and he reports that the Beaver is a remarkable flier. With the publication of this, his fourth, construction article on floatplanes, Ed may be well on the way to establishing a standard reference library for floatplanes. Ed's also the co-editor of the Northwest Float Flyer Newsletter*, so watch this guy. He's very good at what he does.

Schneider Race Update

This is the second to last time that I'll talk to you about the upcoming Schneider Trophy Re-Creation* at Lake Havasu, AZ, on November 10-12, 1989. I just received a letter from Bob Martin, the event chairman, asking me to thank all our faithful readers who have responded to Bob with inquiries or who have committed themselves to participating in this event. It's certainly nice to know that we have this growing community of float fliers. Essentially, the Schneider event will be our first public outing as far as mass media is concerned, and it's wonderful that people as competent as Bob Martin and the Desert Hawks R/C Club are putting it all together.

Our gallery includes a couple shots of Schneider entrants. One is the Bob Martin group's Curtiss R3C-2, which took the cup for the USA in 1925 with Jimmy Doolittle hanging onto the stick. This 1/3-scale 88-inch bipe is all built-up with Parson's* 6-ounce cloth or Sig's* Coverall. As pictured, the Curtiss still lacks scale detail, paint, prop, Futaba* radio and a Sachs* 3.7 powerhouse for an engine.



Author reveals new foam-cutting technique and foam configuration. (See text.)

The aircraft is functionally rigged using clock-spring flat wire and Du-Bro* steel turnbuckles. Finished weight will come in around 30 pounds according to Bob, and flight tests will be underway as you read this. This puppy will have to fly more than 77mph to hit scale speed. I can't wait!

The other Schneider pic is of Bill Curry with his 1925 Macchi M-33, which was flown to last place by an Irishman named de Briganti. An interesting aspect of the race re-creation will be that 25 percent of the total score will depend on the R/C pilot attaining a scale proportion of the actual aircraft speed. Depending on the aircraft selected, this is going to require some different modeling approaches. For example, the Curtiss R3C-2 mentioned above went 233.6mph in 1925. At 1/3-scale and 30 pounds, Bob Martin's plane carries that big Sachs and has to go pedal-to-the-metal to get the full 25 percent. On the other hand, Bill Curry's Macchi flew 168.4mph in 1925, so, at 1/4-scale, to take full speed points, he'll have to fly a little over 42mph, which is only 20mph over stall for most floatplanes. In keeping with that requirement, Bill has built his Macchi extremely light. Estimated finished weight will be around 16 1/2 pounds with a Super Tigre* 3000 for power.

If you've been following all this, you now see that Curry could beat Martin if his Macchi can hang in the air and fly realistically at 42mph. Of course, we haven't mentioned all the other entrants and what they're doing, so, as you can see, it's anybody's game. All will be revealed in November. I hope that many of you can make it to Havasu. Don't forget that this year's meet is going to be combined with a fun-fly, so bring your favorite floatplane, soak up some sun, see the sights and, above all, enjoy!

As mentioned, next time around is our annual special float issue. The lineup is impressive: Nick Ziroli, Rich Uravitch, Ed Westwood, Chris Chianelli, Bill Price, Clearlake '89, construction articles, floatplane kit reviews, plans, and on and on. Don't miss it! See you then.

**Here are the addresses that are pertinent to this article:*
***EDO,** College Point, NY, (212) 445-6000.*
***Satellite City,** P.O. Box 836, Simi, CA 93062.*
***O.S.;** distributed by Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.*
***Northwest Floatflyer Newsletter,** c/o Ed Westwood, 909 South 173rd, Spanway, WA 98387.*
***Schneider Cup Event,** c/o Bob Martin, 1520-C Acoma Lane, Lake Havasu City, AZ 86403; (602) 855-6900.*
***Dan Parsons Products,** 11809 Fulmer, N.E., Albuquerque, NM 87111.*
***Sig Manufacturing Co.,** 401 S. Front St., Montezuma, IA 50171.*
***Du-Bro Products,** 480 Bonner Rd., Wauconda, IL 60084.*
***Super Tigre;** distributed by Great Planes Model Distributors.* ■

KAVAN SHARK 40

(Continued from page 111)

and hate it, but you'll keep it and fly it—I'm *sure* of that!

**Here's the address of the company featured in this article:*
***Kavan,** 2052 Newport Blvd., Suite 9, Costa Mesa, CA 92627.* ■

HELI CHALLENGE

(Continued from page 71)

Now that you're ready to start rolling your model, let's discuss some of the control parameters that will assist the machine through rolls and make your life a lot easier. First, it's important to set up roll-cyclic throw, as it will allow the helicopter to get through rolls quickly. Be careful not to overdo the throw, but be sure that your response will be adequate to get you through the maneuver without getting you into trouble. If the rotor-head steering on your machine is Hiller only (cyclic pitch control from the flybar only; no mixing of main rotor-blade pitch), you'll have to go for as much throw as is mechanically possible. Even if your machine is equipped with Bell-Hiller mixing (flybar and main rotor blade cyclic pitch

(Continued on page 125)

(Continued from page 122)

control), you should be careful that the stabilizer paddles and main rotor blades aren't so heavy that the control responses are excessively retarded.The weight of the main rotor blade and flybar paddle will greatly influence the characteristics of the helicopter.

Manufacturers of some of the models available suggest the use of flybar weights for training purposes and to improve hover stability. This practice will reduce roll rate, so you'll have to try to find a happy medium somewhere along the line.

The best way to test for roll rate is to get your machine quite high, and then, with the machine moving straight and level in fast forward flight, push the cyclic control stick to the full right and hold it there until the helicopter rolls over onto its side. Reverse the cyclic pitch to the left until the helicopter is upright once again. (This process shouldn't take more than about 2 seconds.) On the other hand, the roll rate shouldn't be so fast that the helicopter is uncontrollable. Use your judgment, get the roll rate set so that you're comfortable with it. If so equipped, you might want to consider setting up the dual-rate feature of your radio system to have a nice hover in the low-rate position and a snappy roll rate in the high position.

Another factor that's critical to producing good rolls is the location of the model's CG (center of gravity). If the CG is behind the main shaft, the model will try to pitch its nose upward during the roll. Add weight to the nose of the model until the CG is about 1/4 inch in front of the main shaft. You'll find that this will also aid the overall performance of the machine, making most other aspects of flight smoother and more predictable.

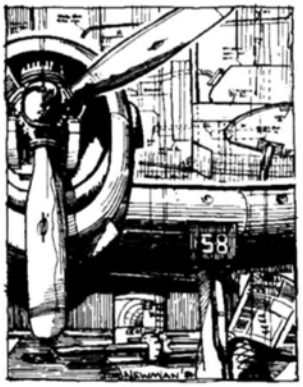
The final step in setting up your machine for rolls will be influenced by the capabilities of your radio system. Ideally, you should set up your collective pitch so that you can get some negative pitch—enough, in fact, to lift the helicopter when it's upside-down. You'll also want the throttle to open enough to keep the rotor speed constant while the main rotor blades are negative.

I've been using the JR* Galaxy Computer 8 radio in my helicopters for a couple of years now, and I've become spoiled by the flexibility allowed by this system. I'll outline the typical aerobatic setup that I use with the Galaxy for most of my machines. First, set the aerobatic pitch curve up for the throttle/pitch one-switch position (high-idle on some radios). The curve is set so that the top end is the same as the normal pitch curve, which is the most pitch that the engine will handle at full throttle. Then the hover point is set so that the pitch is around 2 degrees less than the normal hover point at half stick. This provides a smoother transition from positive pitch to negative pitch, so that the collective doesn't feel "jerky" as the stick is moved from the high to low positions. The low end of the pitch curve is set to the maximum available negative pitch, but this shouldn't exceed the level of pitch that would allow the engine to bog down. The throttle curve is set so that the rotor speed will remain constant regardless of the throttle/collective stick position. Usually, the throttle will be wide open with the stick at both the high and low positions. This setup will let you roll the helicopter over and fly it upside-down without flipping into the inverted flight mode.

If your radio system won't allow for this type of setup, you can still get a fairly good roll from your machine by taking as many of the outlined steps as possible. If your system has a high-idle mode, you'll usually be able to have the collective pitch drop into negative while you operate the throttle at a higher position than idle, and this will prevent the loss of rotor speed. Just be careful that you don't open the throttle to the point that the rotor overspeeds as you transition from positive to negative pitch. Some radios will allow you a unique pitch curve for the high idle, and some won't. If you don't have a high-idle pitch curve, set up for about 2 to 3 degrees of negative main rotor pitch with the stick in the low position, and fly the helicopter to be sure that this isn't too much negative pitch, which would make the helicopter hard to control during descents from forward flight back into hover. If your radio isn't equipped with any type of high-idle system, you'll have to set the pitch curve up for about 2 degrees of negative pitch. When you're getting ready to go into forward flight, advance the throttle trim to the full-high position, as this will serve as a simple high-idle system, helping to keep the rotor speed up during the maneuver.

Now that our machines are all set up, we can go to the field and perform our first roll. Start with the helicopter sufficiently high to recover from a mistake or two, but not so high that you can't see it well. Do your first rolls downwind, and from a fairly fast forward air speed. If your heli-

(Continued on page 135)



Sporty Scale Tec

Colors, Sources and

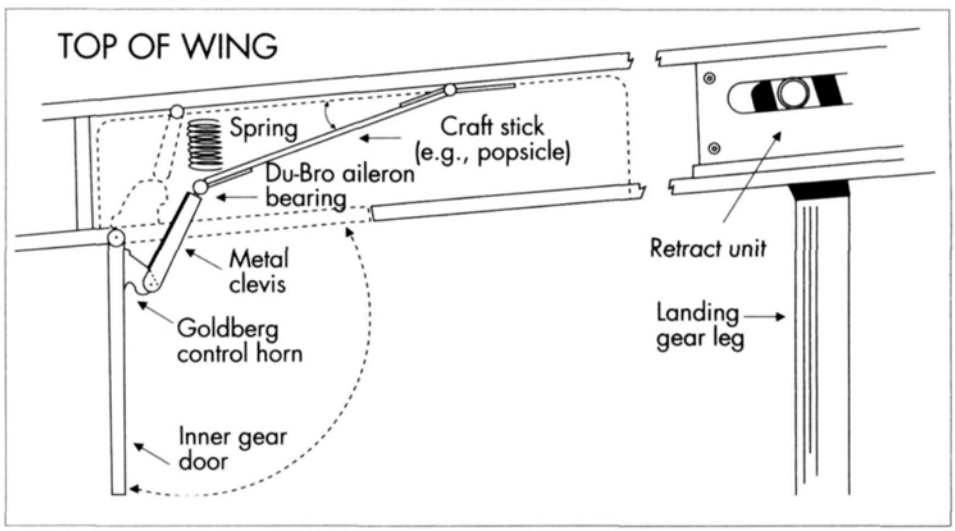
by FRANK TIANO

Roger Thomas' brother Dave submitted the photos of Roger's SBD and raises some important documentation questions regarding finish, color and markings.

"HOW DO YOU KNOW what colors to use on a particular aircraft, and where do you get the color chips, or paint, for the model?" With his brother's SBD in mind, David Thomas from Cleveland, OH, wrote to ask me this. Well, at first I thought that David just hadn't been paying attention to my column; then I realized that although I recently provided the "how to" go about getting the F.S. 595 color chips, I never addressed the problem of deciding exactly what colors the aircraft might have had in the first place!

First, Dave, you have to buy books—maybe *lots* of books! Get a Zenith* or Historic Aviation* catalog and read it carefully—*very* carefully. Both sources have scads of aviation books on everything from Ford tri-motors to the first prop-driven F-18! Anyhow, somewhere in those illustrated pages, you'll see titles like "U.S. Navy Camouflage and Markings, 1940-1944," or " U.S. Air Force Camo and Markings, Vietnam Conflict," or "Luftwaffe Color and Markings, 1939-1942, European Theater." Next, you fill out the order form, add one of mommy's checks and two bits for a stamp, and wait for your books to arrive. If you read the catalog carefully, you'll probably find a few lines that go something like this: "All Navy scout or dive bombers went through a transition that involved three different color schemes. First, they were all light gray; then, for a short period, they were three-tone blue; and then, later on, they were painted *all* blue." It's a simple matter to place your subject aircraft into one of these categories just by studying a picture and its caption. If the picture shows rough camo (indicating two or three colors), and the caption says the SBD is from Squadron 12, stationed on the Lexington in 1943, it's fairly easy to determine from the camo book exactly what the colors were. Once you know the colors, you merely look in Federal Standard No. 595 for the proper chip. Get the picture? If not, maybe Captain Stunning can explain it better.

The most important thing to remember is that you must buy or rent (but aren't likely to be able to borrow) the books. There's absolutely no camouflage fairy who can put this information under your pillow—I promise you that!



An effective method of actuating inner gear door uses tire contact against popsicle stick to close door.

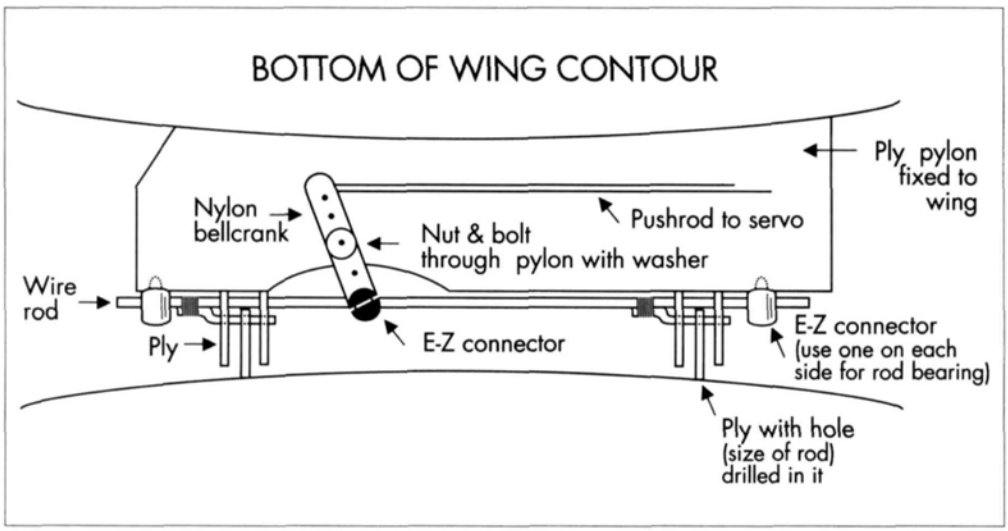
hniques

Linkages

Next, I'd like to show you a bomb- or tank-dropping mechanism I've used for some time. The drawing offered by Mike Bacon should be self-explanatory. The two E-Z connectors on each end of the plywood pylon are embedded into the plywood by drilling a 3/32-inch hole and zapping the pin into place. They provide an excellent guide for the wire rod to slide through, fore and aft. When you have everything set up properly, just go ahead and build up around the plywood pylon with balsa to get whatever cross section you need. (Once again, see Steve for any further explanations.)

Frankie T's very own AD Skyraider in late-Navy gray-over-white scheme. A wide variety of schemes is available, from the early-Navy overall gloss blue to the Vietnam-era camouflage found on the Sandys.

Along similar lines, I thought it would be a good idea for Mike to draw up an additional diagram of the hardware I use to open and close the inner landing-gear doors on a typical retractable installation. Once again, the drawing should be self-explanatory. A piece of 2-56 threaded rod is placed through the aileron bearing, and the clevis is threaded onto it. Adjustments are made at this end to make the inner door fit tightly when the landing gear is retracted. Install everything so that the outside of the tire just comes in contact with the craft stick, forcing the stick to lie against the top skin of the wing, pulling the inner door closed behind it. A lightweight spring can be used to ensure that the inner door won't be accidently closed by air pressure. On large models, however, the weight of the door itself seems to be enough to keep it in the fully open position until the gear comes up.

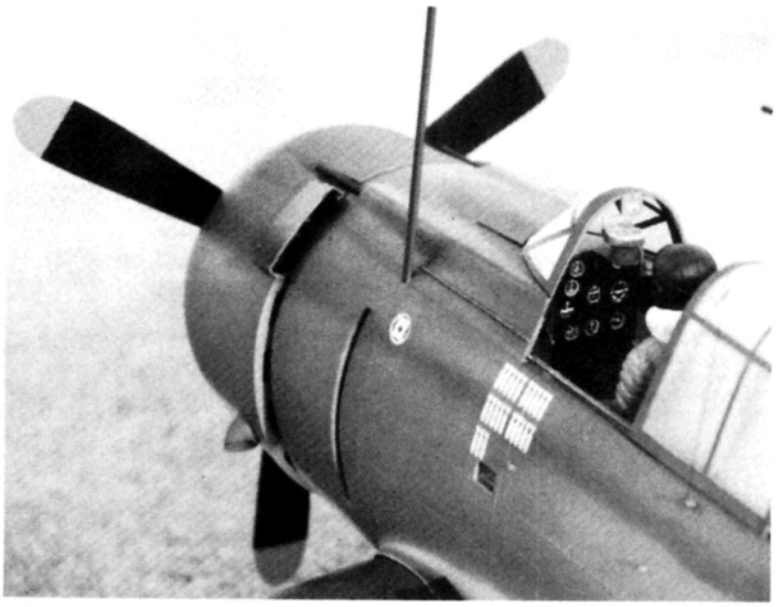


Bomb or external store release mechanism

Last, but not least, I promised to pass on to you all the ways of duplicating a real metal finish with aluminum paint. Well, to tell you the truth, I didn't get one single letter offering some new revolutionary method; in fact, I didn't even get a letter offering some *old* revolutionary method! So you'll just have to be happy with the way *I* do it.

First, you must understand that even polished aluminum airplanes get really dull in a hurry if they aren't maintained. During WW II, our people rarely had time to polish fighters and bombers, and even when they did, it was usually done to a camouflaged aircraft in an attempt to reduce drag. Near the end the war, when our

(Continued on page 130)



Close-up shot of Roger Thomas' SBD-5A Dauntless built from the Dynaflite Master Scale kit. This is Roger's first attempt at scale! Watch out, Kent Walters!

air superiority meant that we no longer needed camouflaging, quite a number of aircraft went through to the front in a natural metal finish. This glossy appearance isn't usually the finish we want to duplicate; we're after that special look of tarnished, oxidized aluminum and unobtainium that has no reflective value whatsoever.

If you mix 20-percent K&B* aluminum paint, 20-percent HobbyPoxy* silver paint, 30-percent K&B flat satin hardener and 30-percent K&B thinner, you'll have the beginning of a tarnished, aluminum finish. Paint your airplane with this mixture (thinning more if necessary), using no more than 40 pounds of pressure in your touch-up gun. Make absolutely certain that the paint flows on smoothly.

After a couple of very light coats, put the airplane out to dry in direct sunlight. If it's cloudy, you have two choices: Either put it in your dust-free shop for three days, or send $279.95 to Norm Berger for his World War II, Direct Sunlight Kit and put it in there for six hours. (Be sure to mention that you want the Scale Aluminum Kit with the No. 8 brightness rating factor.)

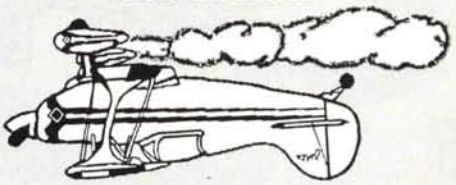
Whichever method you choose, when the paint has fully cured, tape off a few panels at random and spray them with the same paint, but add a few drops of black to this batch. This turns the shade of aluminum just a wee bit darker and less metallic, and this makes a subtle difference in appearance. Once this has cured, you must gently sand all the paint with a soaking-wet sheet of No. 600 Wet-or-Dry sandpaper. Wipe the surface with some window cleaner, paint on your markings and any other colors you want to add, sand these, too, and you're done. You'll notice that the careful wet-sanding has almost polished the aluminum/silver paint mixture so that it looks very much like tarnished aluminum skin.

That's about it for this month. I'm still adding to my wish list, and I've actually received a few responses from manufacturers. I'll be certain to keep you posted as things develop. For this month, I wish for tires (without hubs) and hubs (without tires). I'd also like a whip antenna for our scale models; an iron-on fiberglass-cloth-covering system; a re-issue of the old I.M. 1/8- and 1/7-scale full pilot figures; a small vacu-forming machine; a V-2 .16 cubic-inch engine formed from two O.S. 1.08s in a "vee" form for a lower profile offering gobs of power; servos that can be adjusted externally; and a 1500mAh battery pack that uses a little of its own juice to recharge itself as it's discharging.

I know it's gonna be a long time before we see most of this stuff, but it's sure nice to dream. Until next month, remember these three very important things concerning modeling: Never let Chris Chianelli know that he looks like the "before" in a psychiatrist's commercial; never pre-rivet your wing skins before gluing them to the ribs; and never, *ever,* fail to check your six!

**Here are the addresses that are pertinent to this article:*
***Zenith Aviation Books**, 729 Prospect Ave., Box 1, Osceola, WI 54020.*
***Historic Aviation**, 3850M Coronation Rd., Eagan, MN 55122.*
***K&B Manufacturing**, 12152 Woodruff Ave., Downey, CA 90214.*
***Hobby Poxy Products,** 36 Pine St., Rockaway, NJ 07866.* ■

Club of the Month



The Boulder Aeromodeling Society

THE NAME OF THE GAME is fun, and the Boulder Aeromodeling Society doesn't seem to have any trouble remembering it. The BAS newsletter, "The Inverted Flyer," stresses fun, friendliness and good flying. President Phil Youngren vowed to keep the business part of the meeting down to 30 minutes, so club members would have more time for the fun parts, like "hangar flying and lie swapping." The newsletter also reported that Chuck Armantrout is working on the season's new line of apparel that's a must for the well-dressed BAS member; Phil Youngren offered tips on proper use and storage of CA; and Bob Corwin presented information on radio upgrades for 1991, and he quoted from Frank Tiano's column in good ol' *MAN!* Dave Howe contributed an enlightening and entertaining look at a problem that plagues modelers: third order intermodulation.

The Boulder Aeromodelers are a friendly and far-sighted bunch: Losing fields and attracting new members are two of the most important issues facing the hobby, and this club is doing all it can to present new and unique solutions. The club rules stress being friendly to spectators and newcomers, keeping noise down, and generally maintaining good relations with the community. In his President's Message, Phil Youngren stated that modelers must do more to help the beginner modeler by sharing their experiences: "By helping each other, especially beginners, we will be better off as individuals and as a club." The fund-raising committee reported that funds would be used not only to make improvements and repairs at the flying field, but also to "generally improve the visibility of the Boulder Aeromodeling Society and attract new members." Aside from the usual fund-raising methods (e.g., auctions, membership fees, etc.), Ed Hogan and Chuck Armantrout suggest that club members teach modeling, R/C and flying courses through City of Boulder recreation centers and school systems. What better way to attract new modelers and keep our hobby alive?

In recognition of its members' good sportsmanship and attention to community relations, *Model Airplane News* is pleased to award the Boulder Aeromodeling Society with two free one-year subscriptions to be presented by them to two outstanding members. ■

HELI CHALLENGE

(Continued from page 125)

copter's main rotors rotate clockwise when viewed from the top, do your rolls to the right; if counterclockwise, do them to the left. This will allow you to work *with* the torque forces instead of *against* them. To begin the roll, start with the nose of the helicopter level, and feed in right (or left, for counterclockwise machines) cyclic pitch. *Don't* touch the fore or aft cyclic pitch unless absolutely necessary (you shouldn't have to, if the CG is correct). As the helicopter rolls over onto its back, reduce the throttle stick to unload all the positive pitch from the rotor disc and to prevent the helicopter from losing altitude. Practice is the only way to get this part right, since every helicopter will be a little different upside-down. Continue to hold in the roll cyclic until the helicopter rolls upright, while at the same time, returning the throttle to the high position. Exit the roll as you entered, by flying away straight and level.

One of the most critical parts of the roll is the inverted portion. You can get into trouble if you attempt to fly the fore and aft cyclic, often over-pitching the helicopter's nose up or down and causing the rotor disc to stall. If this occurs, allow the helicopter to fall for a short period to regain air speed and pull on the back cyclic to get the machine back to upright. Try to keep your head while going through the maneuver so that you'll be able to recover safely from any attitude in which the machine winds up.

Before attempting the full roll, try rolling the helicopter over onto its back and pulling back cyclic until the nose recovers to the level position a few times. This maneuver is called a split-S, and you might want to practice it anyway, as it will give you some experience of recovering from trouble before you actually get into it. Many pilots get into the bad habit of pulling the nose high at the beginning of a roll. This won't help you maintain altitude through the roll and will always produce a very nose-low attitude as the helicopter rolls inverted.

Practice rolls repeatedly until you can complete a full slow roll with little or no loss of altitude and with no change in heading. This maneuver will really impress spectators, and it's quite beautiful when performed correctly. As you roll, listen to your rotor speed to be sure that it doesn't drop too much or over-speed. Work on your pitch curves and throttle curves until you can get the rotor speed fairly constant all through the maneuver.

That completes our discussion of the roll. Next month, we'll mix the loop and the roll to make some new maneuvers. Until then, get those rolls down to perfection.

**Here are the addresses of the companies mentioned in this article:*
***Gorham Model Products,** 23961 Craftsman Rd., Calabasas, CA 91302.*
***JR Propo;** distributed by Hobby Dynamics, 3132 S.Highland Dr., Las Vegas, NV 89109.* ■

ECLIPSE

(Continued from page 88)

another fuse with me, but after a few minutes, I figured out that my car had lots of fuses in it!

The second flight started with a beautiful launch and a shallow, but positive, rate of climb (I wasn't going to push on the first flight) for about 300 feet. I shut down the motor, the prop folded back as advertised, and a-thermal hunting we went!

Since that time, I've made many more flights with no problems, and the airplane flies very well. If you're wondering about the power of the geared electric, it's about the same as a regular .049 glow engine on a 2-meter glider. Plenty of power, but certainly no vertical performer.

Most modelers may not even be aware of the fact that Airtronics is in the kit business, thinking of them only as a source of high-quality radios. Apparently, this quality spills over to their balsa kit line. It's evident in the Eclipse.

**Here are the addresses of the companies mentioned in this article:*
***Airtronics Inc.,** 11 Autry, Irvine, CA 92718.*
***Hot Stuff,** Satellite City P.O. Box 836, Simi, CA 93062.*
***Klett,** distributed by Carl Goldberg Models, 4734 West Chicago Ave., Chicago, IL 60651.* ■

BUILDING AIRPLANES

(Continued from page 91)

from using hard balsa where light wood would do, except, perhaps, increased resistance to rough handling.

Second: It takes a lot of time, trouble and excess weight to cover up every trace of wood grain in finishing a balsa-surfaced construction. I don't find visible wood grain objectionable, even on a sport-scale model of an all-metal aircraft such as a Spitfire or a Zlin. When the surface of a model has the same general appearance all over, it doesn't look abnormal, and that's why I don't bother trying to make my models resemble polished plastic. Visible wood grain and all, my airplanes look good to me, and I think they fly far better than they would with a flawlessly smooth, heavy finishes.

Third: For tail surfaces, thick, lightweight balsa is preferable to thinner, heavier stock. Thicker wood is stiffer and less likely to warp or flutter, and it can be shaped to a streamlined airfoil cross section. (Square-edged tails offer no advantages, other than being easier to cover with MonoKote.) And by tapering the thickness of a tail surface (thick at the fuselage junction where stress is highest, thin at the tips where stress is low), the weight is kept to a minimum.

Fourth: For sheet-wood construction, I use *only* balsa. I've never cared much for lite-ply, the poplar Italian plywood that many model kit manufacturers are using these days. True, the stuff is inexpensive, particularly for model parts more than about 4 inches wide, but it's much heavier than balsa, and I find it excessively brittle. When lite-ply breaks, it does so like a soda cracker, crumbling at the edges into tiny fragments that are next-to-impossible to fit back together. A broken balsa part can nearly always be reassembled, especially with today's marvelous CA adhesives; not so with lite-ply!

In spite of its difficulties, built-up model construction has a charm and a challenge all its own. A model airplane framework that's composed of many carefully assembled pieces of wood is a genuine art form that's admired even by people with no particular knowledge of aviation or airplane models. And there's no lighter way of constructing a miniature aircraft.

As a comparison, I have two R/C models with tail surfaces of approximately the same size: a stabilizer span of about 20 inches and a 6-inch fin height. Completely finished and ready for flight, my built-up tail assembly weighs 1½ ounces;

NAME THE PLANE CONTEST

CAN YOU IDENTIFY THIS AIRCRAFT?

If so, send your answer to **Model Airplane News**, Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

CONGRATULATIONS TO TOM REW of Providence, UT, for correctly identifying the Piaggio PD-808 twin-jet utility transport shown in our May issue. Tom's name was drawn from the 21 correct answers submitted. Not surprisingly, a good number of you identified the Piaggio as a Lear Model 23.

The PD-808 was developed as a joint venture between the El Segundo Division of Douglas Aircraft, which performed the basic design development, and Piaggio of Italy, which manufactured the aircraft at its facility in Finale Legure, near Genoa.

Originally developed to fill the need for a high-performance bizjet, at the time, the requirement didn't materialize, so the Italian Air Force provided funding for the completion of 25 aircraft to be used as navigation trainer/VIP transports. Powered by a pair of Bristol Siddeley Viper 525 engines, each rated at 3,000 pounds of thrust, the 41 1/2-foot-span PD-808 had a range of 1,600 nautical miles and a max speed of 546mph. ■

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to **Model Airplane News.** If already a subscriber, the winner will receive a free one-year extension of his subscription.

the all-sheet tail comes to twice that. Even low-density foam wings can't match built-up ones for low weight. My Ace High foam wing weighs just over 8 ounces for its 410 square-inch area, and that's more than double the ready-to-fly weight of my 420 square-inch, built-up-from-balsa Awkward Auk wing.

Which, then, is the better form of construction for radio-control model airplanes?: sheet balsa or built-up? I like them both equally, but in a knockabout, fly-anywhere R/C model, sheet construction stands up to punishment better. On the other hand, for a model to show off your craftsmanship abilities and to attain the widest performance envelope in flight, a built-up airplane is the way to go.

Why not try them both and see for yourself which you prefer? After all, it's *your* hobby we're discussing, and nobody knows more about your personal likes and dislikes than you do! ■

ABOUT THOSE ENGINES

(Continued from page 94)

pouring it out of a big container into a small refueling bottle can cause a big drop in ether content. What's needed is a pump to facilitate refueling directly from the metal can, as glow engine users do. Unfortunately, nearly all commercially available glow-fuel pumps are unsuitable for diesel fuels and gasoline. And in any case, you should *never* use an electric-powered model fuel pump for anything but glow fuel! Sparking at the pump motor brushes can ignite ether or gas vapors *very* easily.

As shown in the accompanying photos, a Sig* Pressure Fuel Pump can be reworked into a unit that's suitable for any type of model fuel. Only the bulb is used from the Sig pump; the other parts are Du-Bro's* Fuel Can Cap Fittings (two sets required) and Tygon tubing. These are joined to the metal cap of a fuel can and sealed with three-hole washers cut from polyethylene bleach-jug plastic.

Holes in the washers are easily made with a 1/4-inch paper punch. The holes in the cap must also be punched out, because it's extremely difficult to drill smooth, round holes in thin sheet metal. I clamp a block of metal or very hard wood to a drill-press table and then bore a 1/4-inch hole in the block. Then I reverse the drill in the chuck so that its blank end points downward. In this position, it works as a punch, and the hole in the underlying block serves as the "die." (Hole-punching this way is easier if the drill bit's butt end is ground flat and sharp-edged.)

The big advantage of a pump like this is that its fuel container can be enclosed in insulating foam (preferably polyurethane), then wrapped with aluminum foil. This helps greatly in keeping the fuel cool. And insulating the model's fuel tank inside the fuselage is also a good idea, particularly for diesel-powered airplanes.

Where glow fuel is concerned, many modelers think they can save money by using the cheapest stuff available. After all, it only gets burned up; why pay extra for name-brand types? But this is faulty reasoning. Good fuel is not expensive; as Powermaster's* Don Nix pointed out to me in a recent letter, their total markup

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Classified

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

SCALE DOCUMENTATION: Plan Enlarging. Photo packs, 3-view drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport. 80-page catalog $4. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239.

PLANS ENLARGED, Large Scale Specialists. PC Model Software. Free catalog. Concept, P.O. Box 669E, Poway, CA 92064; (619) 486-2464.

WANTED: Berkeley and Cleveland kits or related items: parts, plans, boxes, brochures, books, ads, radio equipment, accessories, etc. Gordon Blume, 4649-191st Ave. S.E., Issaquah, WA 98027.

GIANT SCALE PLANS by Hostetler. We fly what we draw. Send SASE to Wendell Hostetler's Plans, 1041 B Heatherwood, Orrville, OH 44667.

STRIPPED GLOW PLUG THREADS REPAIRED with stainless steel Heli-coils. 2-stroke heads $7.50. 4-stroke $10, postpaid. Send head only. Lee Custom Engines, 10112 Woodward Ave., Sunland, CA 91040.

MAKE A BEERCAN BIPLANE, 9 inches with 14-inch wingspan, $9.95. Kit Three, Box 72104, Marietta, GA 30007.

ENGINES: IGNITION, GLOW, Collectors, runners, used, new. Sell, trade, buy. SASE for list. Rob Eierman, 504 Las Posas, Ridgecrest, CA 93555; (619) 375-5537.

ALL ALUMINUM P-51D Mustang and P-51B Mustang III Precision 1/4 replica scale R/C kits. Extraordinary museum detail and a thrill to fly! All aluminum chemically milled and cut-out/drilled/formed—ready for assembly. Fifty-one sold to date. Complete kit $3000. (Less engine & radio.) Sample rib section and details $25 or SASE for info. Warbirds Aviation, 122 Naubuc Ave., (NAP Bldg.), Glastonbury, CT 06033. (203) 657-3595.

OLD TIMERS, take a ride back in time to airplane modeling roots with this vintage book—*Gas Models*. A true collector's book from the early editors of *Model Airplane News*. It contains the best of modeling from the '30s and '40s, including great technical information and classic construction articles from the Golden Age period. $7.95, add $1.75 S&H; Foreign Surface Mail, add $2.75; Foreign Airmail, $5.50; Payment must be made in U.S. funds drawn on a U.S. bank or by an International Money Order. Air Age Mail-Order Service, 251 Danbury Rd., Wilton, CT 06897.

IMPORTED DIESEL ENGINES—WORLD'S BEST SELECTION: Current production Aurora, Cipolla, D-C, Enya, KMD, Mikro, MK-17, MVVS, PAW, Silver Swallow & USE Diesels. Also Mills and Taplin Twin replica diesels and very special imported glow engines. Catalog $1. CARLSON ENGINE IMPORTS, 814 E. Marconi, Phoenix, AZ 85022.

DISCOURAGED BY TOO-FAST R/C TRAINERS? Ease-of-flying ratings of over 30 popular trainers, $2. Jim Waterman, 3818 Deerfield Dr., San Antonio, TX 78218.

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EMBROIDERED EMBLEMS, Enameled Pins, Your Design, Excellent Quality, Free Booklet, A.T. Patch Co., Dept 68, P.O. Box 682, Littleton, NH 03561, (603) 444-3423.

WANTED: RTF U/C planes and U/C race cars, mite cars; complete or pieces, with or without engines. Buy or trade. John Fietze, Box 1521, Amagansett, NY 11930.

USED AVIATION BOOKS. Free catalog. Want lists welcome. Dan F. Webb Books, Box 6366MAN, Moraga, CA 94570.

WANTED: Model engines and race cars before 1950. Don Blackburn, P.O. Box 15143, Amarillo, TX 79105, (806) 622-1657.

RAZOR BLADES, single edge, carbon steel, first quality industrial. $5 per hundred plus 10% shipping. COBBIE'S GIFTS, RR 2, Box 454-A, Staunton, VA 24401, (703) 885-8036.

25 DIFFERENT PAPER AIRPLANES, $5 postage paid. Folded Flight & Kite, Box 41, Santa, ID 83866.

ENGINE VIBRATION ISOLATOR MOUNTS. Four rubber mounts with 10-24 socket head bolts. $6.50. Penron Products, Box 13051, Arlington, TX 76094-0051.

COST OF R/C GOT YOU TIGHT FOR CASH?! Exclusive report shows you how to start earning money NOW with your knowledge of R/C! For Information Package, send $2 to: REALISTIC CONCEPTS, 40-3 Ushirokubo [Soir K], Room #103, Misawa City, Aomori Ken, Japan 033. [Postage to Japan is 50¢. (2 stamps)]

ALL ALUMINUM P-51D CONVERSION KIT for your 1/5 scale fiberglass model. Convert your existing P-51D model to all-aluminum. Extraordinary museum scale. Use your existing engine and drive line, landing gear, radio and servos. Complete kit $2500. Warbirds Aviation Conversion Kits, 122 Naubuc Ave., Glastonbury, CT 06033 (203) 657-3595.

WANTED: Japanese twin-engine bombers, plans or kits. John C. Fredriksen, 69 Flamingo Dr., Warwick, RI 02886.

PRECISION COMPUTER CUT LETTERING for planes, boats, cars—models or full scale. Free information. Write: AeroGraphics, 511 W. Franklin Blvd., Gastonia, NC 28052. (704) 864-2038, 4-10PM (Eastern).

PRIVATE COLLECTION: Hundreds of aviation magazines for sale: *Popular Aviation, Flying, Model Airplane News, Air Trails, RAF Flying Review, Wings* and many others. 1932-1960. All in excellent condition. Send $2 for list. William C. Fort, Jr., 4161 Robin Hood Rd., Jacksonville, FL 32210.

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WANTED: Hasegawa metal model kit of the Clerget Rotary Engine. Call or write: Richard Tabler Jr., 24 Thorndike St. Arlington, MA 02174 or call (617) 641-1089.

"BEAN ROCKS" by WILLAIRCO, $6.95 per dozen. Beginners, roll-your-own, duration rockets for jet models and matching kits (U-2, F86K, F84, etc.) Send SASE to WILLAIRCO, P.O. Box 90533, Atlanta, GA 30364.

FLYING ACES MAGAZINES wanted. Most pre-1944 issues. For private library. Advise condition and price. Stuart Duncan, 3901 Linda Lane, Annandale, VA 22003.

SCALE R/C PLANS; Giant Plans; Plan Enlarging. Over 200 Vintage Aircraft. Send SASE or $2 for pictoral catalog to: Paladine Communications, 10721 64th Ave. N., Seminole, FL 34642.

FOR SALE: 1910-1960 model magazines, pulps, juvenile aviation books, historical aviation albums. $1 list. Bruce Thompson, 328 St. Germain Ave., Toronto, Ontario, Canada M5M 1W3

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MAGAZINES FOR SALE: *Aeromodeller, MAN, RCM, Flying, Air Trails, Scale Modeller, Wings, Air Classics,* and more. Many back to the 1930s. Excellent to mint condition. Send long SASE for list of titles and any inquiries to: Mrs. Carolyn Gierke, 1276 Ransom Road, Lancaster, NY 14086 (716) 681-4840.

WANTED: Hobby Shack's Pilot Kit No. 100869—"Stephens AKRO" 25 size. Airplane kit. Call Bob (215) 369-0138, or write to Bob Green, RD #1, Box 195, Boyertown, PA 19512.

R/C WORLD—ORLANDO, FL, CONDO RENTALS—2 and 3 bedroom-furnished. Available weekly or monthly. Low rates. 100 acre flying field with enclosed hangar. Swimming pool, tennis courts on site. Minutes from Disney World and Epcot Center. For information call Kyra, (800) 243-6685 or write to Air Age Inc., Condo Dept., 251 Danbury Rd., Wilton, CT 06897.

Send ad and payment to *Model Airplane News*, 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis–retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue.) We do not furnish box numbers. If you would like your ad run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

ABOUT THOSE ENGINES

(Continued from page 137)

between cost of ingredients and manufacturer's selling price comes to less than $1 a gallon. And this under-$1 margin must pay for packaging, labor and all overheads, plant and equipment, amortization and insurance, etc.

As Don says, "Fuel is, without doubt, one of the modeler's smallest expenses, comparatively speaking. Yet most modelers buy fuel with one thing in mind: How cheaply can I get it? It amazes me that a flier will spend hundreds—sometimes thousands—on his plane, engine, radio, etc., but beat the poor hobby dealer's brains out over 50 cents a gallon on fuel. That doesn't make a lot of sense to me."

It doesn't to me, either. I've received several letters about serious engine problems incurred by using cheap glow fuel. Rapid wear, internal corrosion, frequent glow-plug burnout—any, and all, of these can result from inferior fuel. The four biggest U.S. manufacturers of model fuel (Morgan, Red Max, K&B and Powermaster, in that order) buy their ingredients in sufficiently large quantities for maximum economy. No small-scale operation can do better on quality ingredient cost than

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Giant Steps

by DICK PHILLIPS

I'VE BEEN TALKING about *scale* in the past couple of columns—not that anyone can cover such a wide subject in a couple of magazine columns. As many can attest, scale is a life's work, and it can be a rewarding one. I've been privileged to see a number of national scale contests, and I hope to see more. Most of the well-known scale builders are rather likable people, and I've enjoyed their company on a number of occasions; if you can keep quiet in their company, there's a good deal to be learned from them.

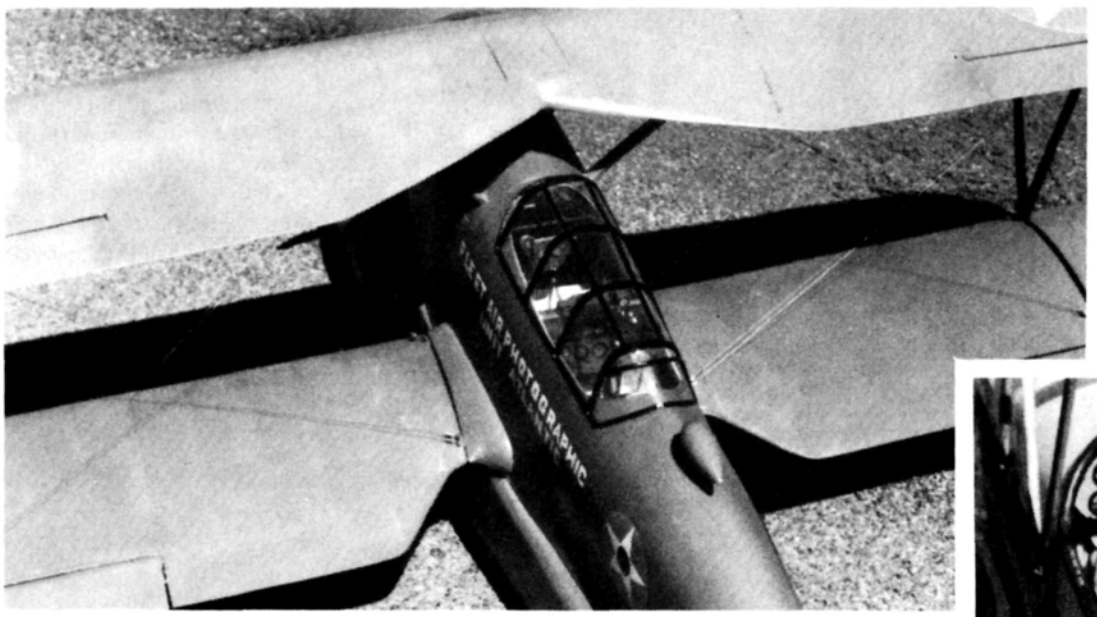
Perhaps not surprisingly, most of us *big* builders are "sort-of" scale people, i.e., "sort of" because we want to build models of full-scale airplanes. But we differ from the true scale addict in that many of us aren't competitively minded. We love building 1:1 replicas of airplanes, but we don't seek to "campaign" them in scale competitions, and most builders of large models seem more interested in the "rally" type of event that has become popular in recent years.

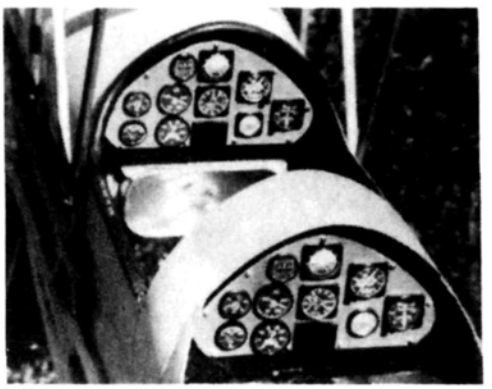
QSAA* (Quarter-Scale Aircraft Association) pioneered this sort of thing 10 to 12 years ago, holding its first meets on the desert outside Las Vegas, NV. This movement was begun by the late Eddy Morgan, but I doubt that he could have envisioned the present size and popularity of such events when fewer than 100 models showed up for the *first* annual QSAA bash.

Then, when IMAA* (International Miniature Aircraft Association) was formed a few years later, those directing its operations adopted the "rally" event, and they've since mounted an annual event that attracts thousands of participants and onlookers. The many IMAA chapters around the world (now well over 100) also sponsor local events that attract participants from rather widespread areas. These events have earned a place in the modeling community, and they seem destined to be with us for a long time. Their atmosphere is relaxed; there's plenty of time to spend with other modelers, and there's time to find out what's happening in the wonderful world of *big*. You're likely to meet Forrest Tucker showing one of his jewel-like 5-cylinder radial engines, Bob Campbell and his C-130 or P-38, or Zimmerman's beautiful deHavilland Moth with its working, hand-built, in-line Gypsy engine. Having attended a few of these events, I can highly recommend them.

If you *do* build large models and enjoy doing it, you should join IMAA. You'll find a good deal of information in "High Flight," its quarterly newsletter, and you'll find out where and when events will take place. You'll also be in touch with several thousand like-minded model builders.

The IMAA's Rally for 1989 will take place in Odessa, TX, on the weekend of June 14 through 18, and I hope to tell you about it in a future column. The main runway at the IMAA Chapter 172 site in Odessa is paved and measures 70x400 feet, and there are three runways forming a triangle, so flying should always be possible, regardless of wind direction. (I hear the wind blows pretty strongly in West Texas, so floaters might have some problems.)





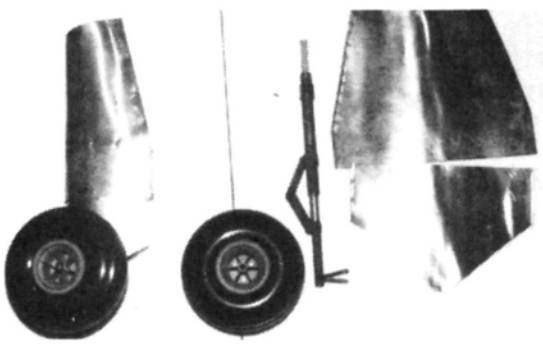
Above: Cockpit detail on any scale model is important, but even more so on the giant-scale birds we build, because it's so much more visible.
Right: Double your pleasure, double your fun. This open cockpit "two-holer" has duplicate panels fore and aft. Instruments mounted on various configuration bezels.

The concept of the "fly-in" or "rally" was really started nearly a dozen years ago by the QSAA. The formula was simple: Invite as many people with big airplanes as you can, and fly, fly, fly. Great place to exchange ideas and do some serious "hangar flying."

Judging from what I've seen so far, the site is a good one, and although it's a tad too far for me to reach, I'll be surprised if the event doesn't break previous attendance records this year.

In "High Flight," the IMAA provides its members with considerable information about events all over the country, and several regulars provide input on large models and their construction. As usual, the Spring '89 issue had well over 100 pages, and advertisements cater to builders of *big* models. In fact, this newsletter is almost a *requirement* if you build *big*.

If you're building a competitive scale model, you'll have to make that model as perfect a replica of the original as possible. If there are working details (flaps, retracts, sliding canopies, cowl flaps, and so on) they must operate reliably, *all* the time, *every* time. (There's nothing worse than a working detail that *doesn't* work at the flight line, or something that falls off the model while it's flying—or *doesn't* drop as intended when it's triggered, e.g., a descending tank or a bomb load). If the detail doesn't always work as it should, you're better off omitting it, and it certainly shouldn't be used in competition.



Scale detailing is frequently easier on giant models than some of the smaller versions because, in many cases, full-scale materials and techniques can be employed. This working gear strut uses a sheet-metal fairing very similar to the real one.

Cockpit detail is important, because on the large models we deal with, such detail is usually easily seen from normal judging distances. A number of firms supply instrument faces, bezels and instrument cases in appropriate sizes for us. Although they are assembled and put in their proper places by the builder of the plane, he or she must notify the judges that they aren't homemade. Well-done instrument panels and cockpit details add significantly to the value of a scale model.

You can go to a great deal of trouble to provide the detail necessary to duplicate a full-scale airplane. Such detailing is the mark of a really dedicated scale builder, and it usually results in

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These photos show the cockpit detail being incorporated into a typical giant-scale model. Note the scale appearance of the seat, which uses real corduroy for the upholstery. Another benefit is the ability to use "toy store" figures for your flight crew, although this Captain may be slightly "out of uniform"!

ABOUT THOSE ENGINES

(Continued from page 140)

the "big four." Thus, to make their low selling prices possible, the "bargain-basement" fuel packagers have to cut corners.

Why take chances with cheapie glow fuel? The best costs less in the long run. Besides, high-quality glow fuel is an excellent bargain these days. It cost more in 1981 than it does now; you can't say that about many products!

**Here are the addresses of the companies mentioned in this article:*
Sig Manufacturing Co., *401 S. Front St., Montezuma, IA 50171.*
Du-Bro Products, *480 Bonner Rd., Wauconda, IL 60084.*
Powermaster Products, *10103 Freeman Ave., Santa Fe Springs, CA 90670. Tel: (213) 946-6511.* ■

QUIET FLIGHT

(Continued from page 144)

in place. (They must pivot freely to ensure that the control surface will return to neutral every time.) The area where the pivot bolt passes though the vertical stab should either be made of spruce or reinforced with plywood.

The position of the pivots and control horn can be seen in the side view. Position the pivot horns proportionately according to this view. The outer pushrod sleeve will exit the fuselage at the front of the vertical stab. The curve of the leading edge of the vertical stab shouldn't be too radical, or it might cause binding in the pushrod. The best pushrod to use is the flexible-cable type. The outer sleeve should stop at a point that will allow the cable to go straight up to the control horn. It will be necessary to use a small horn cut down to the first hole. If possible, use flat-head screws (or bolts) for the pivots and control horn. These can then be countersunk to obtain a smooth, flat surface for the stab to rest on.

The main drawback to this modification is that it will add weight in the tail area. Not only is there more material used in the mounting of the horizontal stab, but it's also necessary to build the vertical stab stronger than usual. Since it now supports the entire horizontal surface, you have to reinforce it with additional gussets, spruce, and/or plywood.

If you want your next model to look a little different, try this simple T-tail modification. If you'd like more information on a modification, drop me a line, and I'll see if I can illustrate it for you and the other readers.

Till next time...good thermals and a full charge! ■

GIANT STEPS

(Continued from page 142)

higher scores, particularly if it's *really* well-done. After all, that's what makes scale models what they are.

The first step in obtaining the necessary detail is gathering the documentation. I've previously mentioned that your model will only be as good as your documentation, and the time to gather it is *well before* construction begins. Building a model and then finding appropriate documentation is definitely *not* the way to go, but it's unfortunately all too common. A well-done model built for the fun of it might be good enough to enter in your club's scale contest, but supporting it with accurate documentation can be difficult. It's far better to put the documentation together first and then build the model according to it. It's always easier to alter a kit or plan to conform to the material you've gathered than to try "reverse engineering" on your model in an attempt to match the material you've found *after* the fact.

Keep in mind that few airplanes that went into serial production remained totally unchanged during the time they were built. Most were being continually improved, and many of these changes are evident in photos taken at the time of production. You might find pictures of airplanes of the same make and model, but you'll be able to see differences between them. You might have to do a little sorting and selecting when you start putting together your "final" documentation material for contest work, and that's why it's important to have the material on hand *before* construction begins. Any necessary changes are a lot easier to make during construction than they would be if they had to be made on a completed model. It's the old story: Make sure you're right before you start gluing pieces together.

Model Schneider Cup

I occasionally hear from Bob Martin*, the event chairman for the Schneider Cup reenactment at Lake Havasu City, AZ. He says that several of you have contacted him about entering the event later this year, and I'm delighted that I encouraged your participation. I guess this event will become a classic and will see more and more entrants as time goes on.

Bob sent me a photo of their test Schneider Cup model, which is a Curtiss R3C-2 model of the original that was flown to a win in the 1925 Schneider by Jimmy Doolittle. The model looks great, but it hadn't been finished or flown at the time the picture was taken. Bob promised to keep me in touch with progress and to tell me about the test flights of the Curtiss.

The model now weighs 27 pounds, but the finished weight will probably be 30 to 32 pounds. Power will be provided by a 3.7 Sachs-Dolmer, which Bob hopes will provide a scale speed of 77mph. Considering the wing area of this biplane, at the predicted weight, it should come up to expectations.

I saw the bare-bones model at Las Vegas, NV, in October last year, and it's a most impressive structure. The model was to go to Toledo and will be test-flown shortly after its return from the show. I expect to have further information from Bob and the Desert Hawks R/C Club, which is sponsoring the event. The airplane is actually owned by well-known, "large-scale" modeler Bob Jones of Lancaster, CA, and it will be returned to Bob after it has been used for promoting the November '89 event. Looks to me as if Bob has made himself a good deal and will end up with quite a model!

Briefly, the plan is to fly models of airplanes that actually competed in the Schneider Cup Races. The rules have been set up in such a way as to provide "rules of equalization" for airplanes that didn't compete with one another in the original races. The original races spanned several years at a time when racing airplanes were making considerable progress, and at the event, airplanes flown in all the original races will compete fairly with one another.

If you're interested in participating, or just being there as a spectator, contact Bob Martin at the address shown at the end of this column for additional details. I hope to attend (for any of us who live in the north, November is a good time to be in Arizona!), and from what I've heard, attendance will be good. Aside from the fact that the location is excellent, the recreation of such a historic event is an attraction of some importance. (The photo of the Curtiss was taken near the site.) If you're already building an entry for the model Schneider Cup, send me some information and a few pictures of your entry so that I can let other readers see your talents.

Next month, I'll get back to specific construction details and some procedures I've developed over the years. I hope you'll find the material both interesting and helpful. As I don't have an exclusive on good ideas, I'd be pleased to have you share *yours* with me. I always enjoy hear-

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GIANT STEPS

(Continued from page 144)

ing from readers, and I know that many of you have come up with ideas that help the rest of us. Let me know about *your* great idea, and I'll pass it along here and give you all the credit for its development! See you here next month.

**Here are the addresses that are pertinent to this article:*
***QSAA,** P.O. Box 13980, Las Vegas, NV 89112.*
***IMAA,** Robert A. Blaney (Secretary), 14 Parkview Rd., Long Valley, NJ 07853.*
***Bob Martin,** 1520-C Acoma Lane, Lake Havasu City, AZ 86403.* ■

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